PROCEEDINGS

BEEF IMPROVEMENT FEDERATION

RESEARCH SYMPOSIUM & ANNUAL MEETING

April 29-30, 1982

Howard Johnson Motor Lodge
Rapid City, South Dakota

BEEF IMPROVEMENT FEDERATION
ANNUAL CONVENTION

April 29 and 30, 1982

Howard Johnson Motor Lodge
Rapid City, South Dakota

<u>April 28 - Wednesday</u>

5:00 - 7:00 p.m.	Registration

<u>April 29 - Thursday</u>

6:30 a.m.	BIF Board of Directors meeting
7:30 a.m.	Registration
8:30 a.m.	SYSTEMS FOR SELECTION - Richard Spader, American Angus Association, presiding
	GENETICS AND THE ENVIRONMENT; WHY IS THE SYSTEMS CONCEPT IMPORTANT TO THE CATTLE BREEDER - David Notter, Virginia Poly Tech
	ECONOMICS AND THE SYSTEMS APPROACH; SOME IMPLICATIONS FOR CATTLE BREEDERS - V. E. Jacobs, University of Missouri
	FITTING CATTLE TO SYSTEMS; AN ACTION PLAN - Richard Willham, Iowa State University
10:30 a.m.	Coffee Break
10:45 a.m.	SYSTEMS FOR CATTLEMEN; MAKING THEM WORK
	- FOR COMMERCIAL CATTLEMEN - J. D. Mankin, University of Idaho
	- THE SEEDSTOCK PRODUCER - Steve Radakovich, Iowa
12:00 noon	COMMERCIAL RECOGNITION LUNCHEON - Roger Winn, Virginia, BIF President, presiding
1:45 p.m.	TRAIT COMMITTEE MEETINGS
	Reproduction - Bill Durfey, Chairman
	Carcass Evaluation - Greg Martin, Chairman
	Live Animal Evaluation - Dick Spader, Chairman
	Growth and Efficiency of Gain - Jack Farmer and Ken Ellis, Chairmen

4:30 p.m.	ELECTION OF DIRECTORS --Regional Caucuses
5:30 p.m.	RECEPTION AND ATTITUDE ADJUSTMENT
6:30 p.m.	AWARDS BANQUET - Mark Keffeler, South Dakota, Former BIF President, presiding
April 30 - Friday	
8:30 a.m.	FACTORS DRIVING THE SYSTEM - Ken Ellis, University of California, presiding FUTURE AND DIRECTION FOR THE U.S. BEEF CATTLE INDUSTRY -COW-CALF PRODUCTION - Harlan Ritchie, Michigan State University -BEEF THE PRODUCT - Dell Allen, Kansas State University
9:50 a.m.	Break
10:05 a.m.	MARKETING PERFORMANCE BUYING BULLS AND A PROGRAM - Mike Wheeling, Montana SELLING PERFORMANCE CONCEPTS - THROUGH SALE CATALOGS - Bill Rischel, Nebraska - IN PRIVATE TREATY MARKETING - Dave Nichols, Iowa
12:00 noon	SEEDSTOCK RECOGNITION LUNCHEON - Steve Radakovich, Iowa, BIF Vice President, presiding
1:45 p.m.	CATTLE, CAPITAL, AND COMPUTERS - Jim Gosey, University of Nebraska, presiding HARDWARE FOR RANCH COMPUTER SYSTEMS - Harlan Hughes, University of Wyoming APPLICATIONS FOR PERSONAL COMPUTERS - Bill Borror, California, Gerber, California COMPUTERS IN THE FUTURE - Richard Bensen, University of California
4:00 p.m.	ADJOURN Demonstrations of ranch computer systems will be available after the formal program.

PROCEEDINGS OF BEEF IMPROVEMENT FEDERATION

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Genetics and the Environment; Why is the Systems Concept Important to the Cattle Breeder

D. R. Notter
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Before one can usefully discuss genotype by environment interaction and its impact on the system approach to livestock production, it is imperative that we define as clearly as possible what we mean by a "systems approach" and discuss the implications of a systems philosophy in animal selection. For the purpose of this discussion, I will define a production system as simply a farm or ranch. However, even though the farm or ranch may be of primary interest to us here today, we must still recognize that it is also a subunit of progressively larger, overlapping systems such as the beef industry as a whole, the overall livestock industry and the state and national economy. In addition we must recognize that elements of these larger systems can and do have an impact on the individual farm or ranch. Thus the production system is defined as the individual farm or ranch and includes both the innate characteristics of the production unit as well as the external factors that influence its operation.

There are many, many ways to characterize the production system. One categorization that may be useful today is to break the characteristics of the production system into: (1) long-term factors such as basic climatic conditions, geology, topography, capital availability, skills of the owner-operator and long-term supply and demand relationships involving potential products of the system; (2) intermediate-term factors such as basic facilities, current prices for inputs and outputs, labor availability and debt load; and (3) short-term factors such as the specific crops grown or kinds of livestock produced and including all the management, breeding and nutritional practices that are being imposed, or that could reasonably be imposed.

Next, let us consider how systems may be evaluated. In the broadest sense, the "success" of a production system lies in its ability to provide "satisfaction" or "utility" to the owner-operator, or, in some cases, to society as a whole. In a more pragmatic (and quatifiable) sense, a system is evaluated by the economic benefits the owner--operator derives from the system. In the simplest sense, we generally define the success of a system in terms of its profitability. We will use that convention here, but will recognize that in many cases a broader definition of "satisfaction" may be implied when we discuss "profitability". In an ideal world, then, the short-term (variable) components of the system (kinds of bulls used, veterinary treatments imposed, nutritional program, etc.) and, to some extent, the intermediate-term components (facilities and pastures being developed) would be chosen in such a way as to maximize the profitability (utility) of the system.

Thus far I have attempted to show that the systems approach or systems philosophy is nothing more than a version of good farm management. The approach recognizes that your operation is a system of production, just like a steel mill or a coal mine, and that it has certain operational characteristics that should be optimized in order to maximize profit. The objective of a systems approach is to identify the mix of inputs that is best (in some sense) for your system and to provide a basis for making rational changes in the mix as they are needed. The acceptance of a systems approach to beef herd management should not (indeed, must not) complicate management to the point that nothing can be accomplished. Instead, the goal of a systems approach must be to provide a framework for synthesizing available information into functional working guidelines for making production decisions. Also, the systems approach should be designed in such a way as to keep profitability clearly in focus as our ultimate selection objective.

To focus now on beef cattle production systems, we find that the choice of production inputs (which bull to use, how often to worm, whether or not to creep feed, etc.) is often dependent upon other production variables (cow size and milk production, pasture program, relative feed prices, etc.). This is the problem of <u>interaction</u> and represents perhaps the primary difficulty in choosing among competing production strategies. If it was <u>always</u> best (most profitable) to fertilize pastures in the spring, or to select bulls on growth alone, or to sell steers at 1100 lb, management would be relatively simple, but this is not generally true. Instead, we must choose among competing sets of production inputs or strategies in order to maximize profits. We must also recognize that if we change one input in the production system, we may need to change the mix of several others at the same time in order to ensure profit maximization.

There are three basic forms of interaction that must be considered in beef production systems: environment by environment (or management by management) interaction, genotype by environment interaction, and genotype by genotype interaction. The first, although important, is beyond the scope of this presentation. I would only submit as brief examples the facts that the success of estrus synchronization with a short breeding season will probably depend on prebreeding nutritions and that the advantage of creep feeding will depend on the relative prices of grains and forages.

Genotype by environment interaction refers to situations in which genetic types change their relative performance in different environments, or, more specifically, when different genetic types change in rank for some measured variable. In a practical sense, this would mean that the genetic type that was "best" (in some sense) would depend on the environment in which production occurred. A great deal of work on genotype by environment interaction has been done, but relatively little of it has been specifically evaluated from a systems perspective. Most studies involving genotype by environment interaction have centered on the physical environment with some emphasis on the management environment and with very little emphasis on the economic environment.

A classic example of interaction between the genotype and the physical (climatic) environment comes from work done in the Australian tropics by Frisch (1976). In that study, live weight at 15 mo was evaluated for Hereford x Shorthorn (HS), Africander cross (AX), Brahman cross (BX) or Brahman (BR) cattle under various levels of environmental control (table 1). The HS was clearly superior when environmental stress was minimized. However, as environmental control was progressively removed, the performance of the HS cattle declined relative to the performance of the other types. The HS was ultimately the poorest of the four types in an uncontrolled environment.

TABLE 1. BREED GROUP RANKINGS FOR 15-MO WEIGHT FOR FOUR BREED GROUPS IN THE AUSTRALIAN TROPICS AS A FUNCTION OF THE DEGREE OF ENVIRONMENTAL CONTROL[a]

Rank	High level of control	Progressive cessation of: Suppl. feeding	Pinkeye trt.	Suppl. cooling	Worm control	Tick control
1	HS	HS |	AX	AX	AX |	BX
2	AX	AX |	HS	BX |	BX |	AX
3	BX	BX	BX	HS |	HS	BR
4	BR	BR	BR	BR	BR	HS

[a]HS is Hereford-Shorthorn, AX is Africander cross, BX is Brahman cross, BR is Brahman. Vertical lines indicate that two breed groups did not differ. Taken from Frisch, 1976.

Another example of genotype by environment interaction comes from work involving the U.S.D.A. In that study, Hereford and Angus cows of similar breeding were evaluated in Nebraska and Louisiana when bred to the same Brahman, Chianina, Maine-Anjou and Simmental bulls. The birth weights, frequency of calving difficulty and percentage calf crop weaned were measured in the two environments with spring calving in Nebraska and fall calving in Louisiana (table 2). The birth weights of the different types were much lower in Louisiana, and the reduction in birth weight led to corresponding decreases in calving difficulty. Gestation length did not differ in the two locations. Apparently cows gestating during the summer months in a hot environment experience reductions in the birth weights of their calves that may serve to limit calving difficulty. However, if we take our "systems evaluation" one step further, we find that the percentage calf crop weaned was the same in the two locations. Thus other factors apparently acted to even out the effects of reduced dystocia.

A final example of classic genotype by environment interaction involves the performance of lines of cattle developed in Montana or Florida and evaluated in both locations (Koger et al., 1979; Burns et al., 1979). The cattle were transferred from their original location and allowed to produce progeny. The performance of these progeny was then evaluated in order to remove effects of the transfer itself on the results. The results of the study (table 3) show major genotype by environment interaction. In Montana, the Montana cattle were essentially equal to the Florida cattle in reproduction and calf survival, had considerably heavier birth and weaning weights and weaned more pounds of calf per cow exposed. In Florida, however, the Florida

TABLE 2. EFFECT OF LOCATION (NEBRASKA VS LOUISIANA) ON CALVING PERFORMANCE[a]

Breed of sire[b]	Birth weight (lb)		Calving difficulty (%)		% calf crop weaned	
	LA	NE	LA	NE	LA	NE
Brahman	73	89	10	13	86	92
Maine-Anjou	71	93	4	20	91	90
Chianina	75	92	5	12	90	90
Simmental	69	86	1	12	95	91
Average	72	90	5	14	91	91

[a]Taken from Smith et al. (1976), Gregory et al. (1978, 1979) and Williamson and Humes (1980).

[b]All sires were mated to Hereford and Angus cows of similar breeding.

TABLE 3. PERFORMANCE OF LINES OF CATTLE DEVELOPED IN MONTANA OR FLORIDA AND EVALUATED IN BOTH LOCATIONS[a]

Location:	Montana (MT)		Florida (FL)	
Line developed in:	MT	FL	MT	FL
Pregnancy rate (%)	82	83	72	87
Calf survival (%)	90	92	90	92
Weaning rate (%)	74	76	65	80
Birth weight (lb)	81	77	64	66
Weaning weight (lb)	435	402	365	403
Lb. calf/cow exposed	320	306	238	321

[a]Taken from Koger et al. (1979) and Burns et al. (1979).

cattle were markedly superior to the Montana cattle for most traits. The traits showing the most interaction were those which had a large maternal component. This result would support the general recommendation that adapted females are preferable in specific environments, especially if the environment is in some sense stressful.

As we embark on national sire evaluation programs in the beef industry, one primary question that we have really just begun to answer deals with the extent to which national sire evaluations are expected to be consistent in different regions of the country or in different management systems. If bulls are going to rank differently in different parts of the country or in different management-nutritional environments, the bulls may need to be ranked separately for performance in different environments. Just as we now have bulls categorized by some A.I. studs as "not for first-calf heifers" or "for producing replacement females", we could see a time when bulls will be categorized with respect to the desirability of their progeny for use in specific environments.

Several authors have attempted to assess the extent of rerankings among sires when they are used in different regions of the country. Nunn et al. (1978) compared progeny weaning weight records of 12 Simmental sires in four regions of the U.S. (North Central, Texas-Oklahoma, Montana and Western). Significant rerankings of the bulls were observed among the regions. The correlation between the performance of the sires in the different regions was .73. Since a correlation of 1.00 would imply perfect agreeement whereas a value of 0 would imply no relationship between performance in the different regions, these results indicate that bulls ranked in a generally similar manner, but that the relationship was not perfect. Buchanan and Nielsen (1979) investigated the changes in progeny weaning weights of 16 Maine-Anjou sires evaluated in three regions (West-North Central, Southwest and East) and of 30 Simmental sires evaluated in five areas of the U.S. Significant rerankings of Maine-Anjou sires occurred among regions. The genetic correlation for performance in different regions was .77. Significant rerankings were also observed among regions for the Simmental sires, and the genetic correlation was .68. Variation in sire rankings among herds within the regions was also significant in this data, but genetic correlations could not be calculated because of extremely small subclass numbers. Tess et al. (1979) looked at changes in rank for progeny weaning weight of 28 to 35 Simmental sires evaluated in Montana and the Midwest, in Montana and Texas or in Texas and Montana. In this study, the sire by region interactions were uniformly nonsignificant; genetic correlations ranged from .42 to .90. However, the sire by herd interaction (within regions) was uniformly significant. Again, the genetic correlation across herds could not be estimated with acceptable accuracy.

These studies indicate that rankings of sires in different broad geographical regions are similar but not perfect. The rankings of different sires in different herds appear to perhaps be less similar, but the changes are presumably more random in nature and will be difficult to predict. As noted by Dickerson (1962), if genotypes interact with random, unidentifiable environmental factors specific to herds, one can do no better than to select for average

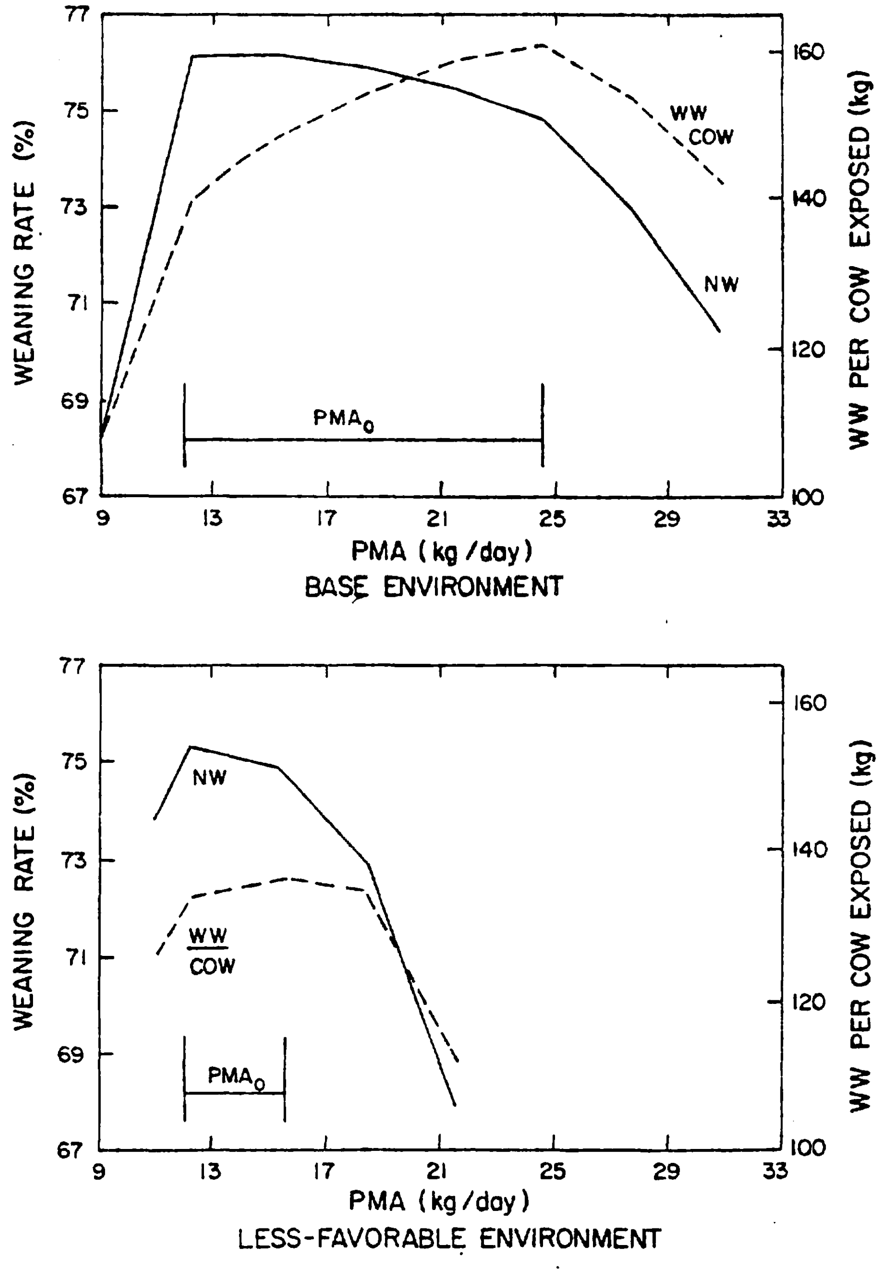

Figure 1. Definition of the feasible range in milk production potential (PMO_0) for a high-quality (base) environment and for a less favorable environment in terms of number of calves weaned per cow exposed (weaning rate; NW) and weaning weight per cow exposed. PMA values (measured here in kilograms) represent the maximum daily milk production potential of the cow types in an unrestricted environment. PMA levels shown range from about the level of the Hereford and Angus (PMA=10.5) to above the level of the Hereford x Holstein (PMA=26).

performance over the range of expected environments and accept that performance will never quite conform exactly to expectation in specific herds. This is what we are currently doing. If sires can be shown to interact with specific, identifiable environmental variables, then we could (at least theoretically) select specific sires for specific environments. However, these major environmental factors have not yet been identified.

Interactions of genotype with the economic environment are, I suspect, prevalent but have not been well-studied. Notter et al. (1979 a) used computer simulation to investigate the optimum milk production level for beef cows as a function of the relative prices of concentrate and forage TDN and of the quality of the available forage. The results of that simulation are shown in figure 1. In this work, the economic efficiency of the production system (measured as cost of production of fed beef) was expressed as a function of the milk production potential of the cow herd (represented as PMA in figure 1 and expressed in kg/day). The PMA values represent the maximum milk production potential of a mature cow of a specific type in an unrestricted environment. The milk production levels simulated ranged from somewhat below the level of the Hereford x Angus (PMA approximately 12) to above the level of the Hereford x Holstein (PMA=26). The simulation results indicated that weaning rate (cow fertility) generally declined as milk production potential increased except at very low milk levels when calf mortality became a factor. Weaning weight per calf invariably increased with milk level whereas weaning weight per cow initially increased but ultimately decreased as cow fertility degenerated.

No single optimum milk production level could be identified. Instead, a range of potentially-optimum milk levels existed for any given environment (PMA_o in figure 1). To define this range, it appeared that one would always want cows that gave at least enough milk to essentially maximize calf survival and weaning rate (NW in figure 1). Higher levels of milk production could be desirable, but one would not want to increase milk production above the point where reduced fertility began to produce reductions in weaning weight per cow exposed. Within this feasible range of milk production levels, the specific optimum point was found to be a function of the price ratio of forage to feedlot TDN. This result reflects the fact that nutrients can either be provided to the calf directly (postweaning or in creep feed) or indirectly (as milk derived from forage by the cow). It is usually biologically most efficient to allow the calf to consume nutrients directly, but it is often economically more efficient to have the cow convert low-cost, low-quality roughage into high-quality milk for the calf. Our results would indicate that if the postweaning ration is cheap relative to pasture costs, then one would want relatively low milk levels in order to produce as many calves as possible to be fed out on the cheap ration (maximize NW). If post-weaning feed costs are high, however, it would be desirable to get as much weight deposited as possible preweaning.

The feasible range of milk production levels was also shown to interact with the production environment. In a high-quality forage environment (upper half of figure 1), a relatively wide range of milk levels was potentially optimal. However, in a less-favorable environment the feasible range of milk production levels was much reduced (lower half of figure 1). To define the optimum milk production level for beef cows in a given production system, one would first need to use research data to define the feasible range as a function of weaning rate and weaning weight per cow exposed. Cost analyses would then be used to identify the specific optimum milk level.

An awareness of genotype by genotype interaction is also pertinent to a systems outlook because it recognizes that multiple traits influence the efficiency of production and that the importance of one genetic trait may be influenced by the level of a second trait. Genotype by genotype interactions become especially important as we crossbreed to match male and female lines to produce a crossbred calf or as we use national sire evalaution data and A.I. to introduce bulls into a herd that may be very different from the existing cattle. In a very real sense, the genotype of the cow herd becomes part of the "environment" for sire evaluation. Massey and Benyshek (1981) evaluated the progeny of 39 Limousin sires mated to both Hereford and Angus dams. Significant changes in sire rank were observed between the two dam breeds. Genetic correlations for sire progeny performance when bred to different dam breeds were .81 for birth weight, .78 for weaning weight and .62 for yearling weight.

Notter et al. (1979b) used simulation to evaluate the effects of sire type by dam type by mating system interaction on economic efficiency in two-breed crossing. In that study, a cow type having a mature weight of 1100 lb was assumed crossed to sire breed types having mature cow weights of 1100 to 1760 lb (figure 2). Two milk production levels (corresponding approximately to the level of the Hereford and, perhaps, the 1/4-Simmental) were simulated. Two mating systems were tested. In the first, all cows in the primary herd were mated to the terminal sire and replacement females were derived from a separate purebred herd. In the second system, young cows (which would be most liable to calving difficulty) were mated to bulls of the same type to produce replacement and only older cows were mated to the terminal sire. The results indicated that when cows of all ages were bred to the terminal sire, there was no advantage in increasing sire breed size above the 1320 lb level. Increases above this level were clearly deleterious when the level of milk production was low. This result was a combination of the effects of calving difficulty and of insufficient milk to support the higher nutrient requirements of the larger calves (especially in young cows). However, when calving difficulty was avoided in young cows, very large sire types became most efficient. The effect of milk level also became less important, because young cows of the low-milk type were no longer being asked to support larger calves.

Summary

In summary, the "systems approach" is not new. Instead it is just an effort to formally recognize the many factors that producers must consider in the cattle business. Genotype by environment interactions are an important consideration in developing a systems approach, but are only a part of the story. Although comprehensive (complex) models may be required to adequately define systems efficiency, these models are not, in themselves, the objective of the systems approach. Rather, our objective must be to

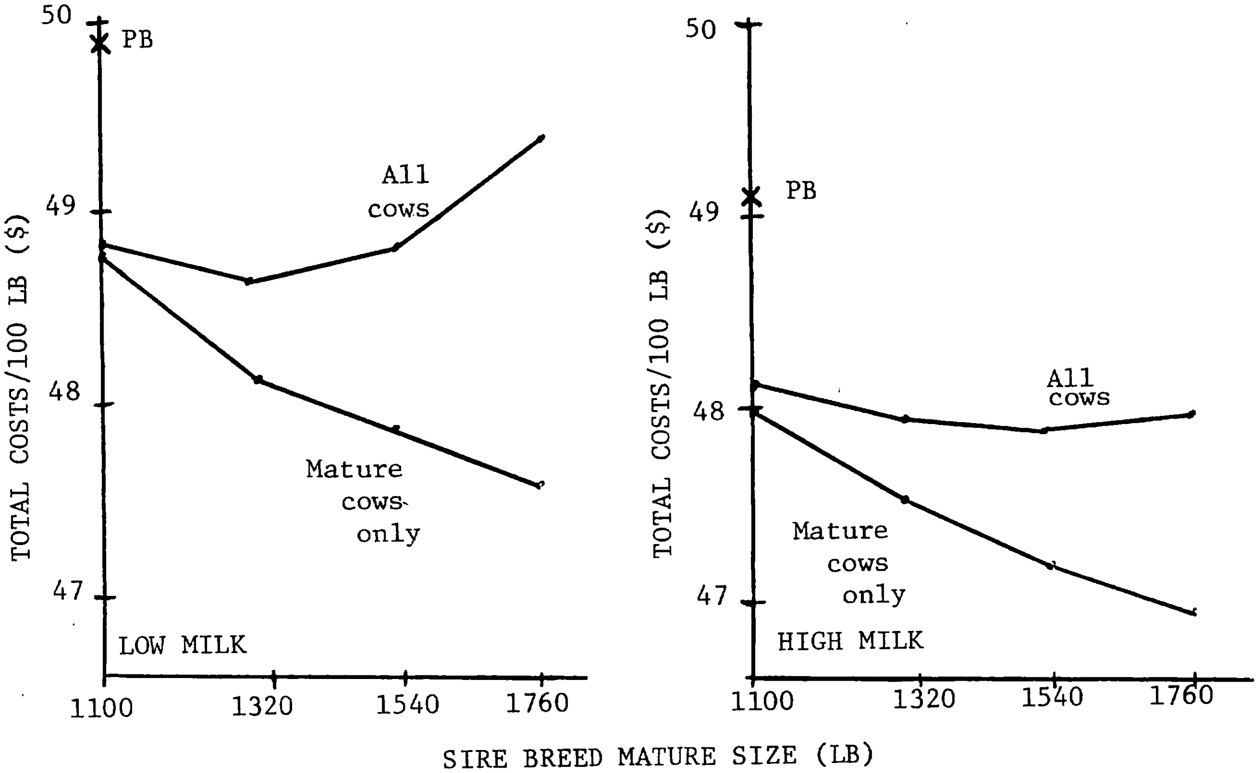

Figure 2. Effects of sire breed mature size (expressed as the mature cow weight of the breed), dam breed milk production level and mating system on costs of production of fed beef in two-breed crossing. The mating systems contrast the situation in which all cows are bred to the terminal sire with the situation in which only older cows are bred to the terminal sire and younger cows are bred to bulls of a similar type to produce replacement heifers. The mature cow size of the dam breed is assumed to be 1100 lb.

translate the results of such models into usable production and selection strategies.

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ECONOMICS AND THE SYSTEMS APPROACH: SOME IMPLICATIONS FOR CATTLE BREEDERS[1]

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Given the obvious cost disadvantage that beef has relative to competitive meats, it is imperative that priority be given to genetic improvement on the cost side. And, this writer will offer no challenge to this seemingly self-evident assertion--except to add one proviso--that we don't substantially sacrifice beef quality or consumer preference for marginal gains in efficiency. Given the most optimistic scenario possible for cost reduction, two realities will still persist: (1) Beef will still be far costlier than pork and chicken; and (2) consumers have, do, and will continue to opt for higher priced beef only because they prefer it! Mess with product acceptability like porcupines make love--with a great deal of care and caution.

Cattle Breeding: Past, Present, and Future

I will not burden you with recounting the fads and fancies *ad nauseum* of the more distant past. You, of all people, are well aware of the "blue smoke and mirrors" of pedigrees, family names, show-winning "grease-balls," and other assorted exercises in fantasy and promotional gimmickry. And you, of all people, have a right to look with satisfaction at the more recent past, as the "performance" movement has revolutionized beef cattle breeding and selection. That great progress has been made, and that our progress is real and has economic value is beyond question. Yet, having said these "nice" things, I'm going to suggest a few things you won't enjoy so much:

1. Much of our selection has been right for the wrong reasons;
2. A "honeymoon" is gradually drawing to a close;
3. A continuation of "ever more is ever better" will lead to economic irrelevancy;
4. The future will demand much clearer thinking, a conceptual "sorting out," an un-learning of some fallacious conventional wisdoms; and
5. A total systems orientation, a bold facing of genetic antagonisms and trade-offs, and a more economic definition of selection parameters will be required.

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[1]An invited paper presented April 29, 1982, at the Annual Convention of the Beef Improvement Federation, Rapid City, South Dakota.

"When the short stave is no longer short . . ."

The greatest achievement of the past one to two decades has been one of "remedying" the ultra small stature selected for in the 40's and 50's. However valid the reasons may have been for favoring smaller size and earlier maturity, it is apparent that the trend developed far too much momentum and was carried much too far. When the feedlot revolution gathered steam in the 60's, it became painfully apparent that our English breeds finished far too light--and attempts to feed them to preferred weights only brought wasty carcasses and prohibitive cost of gain. Selection for gain, yearling weight, frame, composition, etc., all tended toward a corrective and indeed has resulted in a proud achievement for beef cattle breeders and their advisors.

Nevertheless, the primary achievement would appear to be a cattle size more in harmony with desired slaughter weight and feeding systems--rather than that we have tapped some genetic reservoir of "inherently more efficient genes."

In short, we have been working effectively to lengthen the "short stave in the barrel." Now, where do we go once that short stave is at optimal length? While we may not yet be there in our English breeds, we will be--and as producers of tomorrow's gene pools, we have to be future-oriented. Someday--if not today--this single trait corrective selection honeymoon is going to end, and past history tells us that it's hard to halt selection momentum before the pendulum swings too far.

A Time for A Conceptual "Sorting Out"?

As we prepare for the day when "ever bigger" is not "ever better," we need to get our conceptual house in order so we can deal effectively with the more ambiguous, complex challenges to be faced. Systems specificity in selection suggests different breeders selecting for different things. The unity inherent in single (or closely correlated) trait selection could dissolve into an apparent anarchy of different breeders and breeds marching in different directions to quite different drummers. Where, then, for BIF?

First, we need to do some de-programming or un-learning of some "conventional wisdoms" that simply aren't valid:

- "Larger-More Efficient" suggests size and energetic efficiency are identical twins. Conception to dinner plate research with slaughter time standardized by market grade, degree of fatness, or constancy in physiological maturity suggest size and efficiency are not even shirt-tail relatives!

- "Needed: later maturing cattle." It is true that larger mature sizes tend to have later chronological maturity on an average, but early maturity *per se* is no sin, and late maturity is no virtue--apart from size. Adequate mature size is necessary, but within a size class earlier maturity will likely be a virtue and late maturity a sin.

●● "Backgrounding is an inefficient and unnecessary function with the right cattle." This reasonably common feeling displays an ignorance of the economic bases of the beef cattle industry. Cattle are not backgrounded "just" because they are too small and need to be grown out to permit acceptable carcass size. Cattle are backgrounded because most of the time it is more efficient to "give up" calf production to produce growth on forages (especially pasture) than it is to produce it on concentrates in the feedlot. The extent, profitability, and efficiency of forage-based backgrounding depends ultimately on the basic price relationships between feed grains and fed cattle prices. A high "beef steer-corn price ratio" (approaching 30:1 or more) will severely discourage backgrounding as feedlots bid younger, lighter cattle away from would-be backgrounders. A low ratio (20:1 or less) will encourage cow-calf producers to hold calves over and become backgrounders as feedlots prefer heavier, older animals requiring shorter feeds on relatively expensive concentrates.

To be sure, small-size cattle "need" backgrounding more than larger-framed cattle, but the cause-effect relationships over time run the other direction. High beef-corn price ratios cause feeders to place younger animals on feed, and larger mature size is needed to finish at preferred carcass weights. Low beef-corn price ratios force feeders to profit from positive price margins and to prefer older, heavier animals--and less mature size is then needed. Unfortunately, this has been one of the best-kept secrets of the industry!

●● "Fat animals are less efficient because fat contains more calories than lean." There is no doubt animals become less efficient as they fatten, nor that fat contains a lot more energy than protein or muscle--which is mostly water. The causation attributed is, however, quite naive. The most obvious reason why fat animals are less efficient is the same one that gives them a higher dressing percent. More of their weight is in the carcass, leaving much less in the viscera, and their voluntary feed intake declines relative to their metabolic size and maintenance requirement. Thus, in a gross or average feed efficiency context, they simply consume a lot less relative to their maintenance requirement--leaving a lot less of their energy intake for productive purposes. And, even when maintenance requirement is subtracted from energy intake, the partial efficiencies of the energy remaining for production are a lot less different than implied by the comparative energy contents of fat and muscle. Apparently more energy is burned up in transforming energy into protein than into fat.

Again, it's time for sorting out and cleaning up our concepts.

●● "Selection begins with conceptualizing the IDEAL ANIMAL." While simplicity and agreement on common objectives are virtues in their own right, it will be contended later that there can be no "ideal animal" in any abstract or general sense. There can only be an ideal animal for defined uses in defined systems within defined environments. In short, our "ideal" may have to be a bit "systems specific" in its definition. To be sure, certain common denominators may characterize a fairly wide range of systems, uses, and environments, but we probably won't opt for the long-haired Galloway on the Gulf Coast--not the heat and insect tolerant Brahman in North Dakota. Other less dramatic systems-related differences will become increasingly important as the short stave of size approaches an optimum length.

Three Conceptual Issues in Beef Cattle Selection

The prevalence of half-truths, over-simplified conventional wisdoms, and outright inconsistency of viewpoints seems to flow directly from our lack of precision in certain concepts related to beef cattle selection. Thus, it seems to me we need to seek more precision in answering the following three questions:

1. What is Performance?

Since beef cattle production is a business pursued for economic return, it is assumed that "performance" really intends "economic" performance. What do we really know about the net economic value of the performance traits for which we select? What is an additional pound of yearling weight really worth? Below some "threshold," it can be defined in terms of what it adds to sale price, as carcass weight approaches a more preferred weight and this preference is reflected in a higher sale price of the fed steer. Above this "threshold," it may add nothing to sale price--and further additions may ultimately detract from price as the packer finds the carcass exceeds the dimensions of "the box." Boxed beef is today's reality and "The Box" has a finite size dimension.

Or, does increased yearling weight really carry with it a gain in energetic efficiency--or is it simply offset by a larger feed intake? Suppose yearling weight is improved within a given mature size class--through a genetically faster track toward the same mature size--call it earlier maturity or simply a larger voluntary feed intake per unit of metabolic size at the same physiological maturity. Is this an entirely different gain advantage than a larger yearling weight achieved solely through larger mature size? Do they both promise the same gains in energetic efficiency--or lack thereof?

Similar questions can be raised about most performance parameters or selection criteria. Do we really have the kind of research on which we can perform competent economic evaluation of such so-called performance traits--and their differing causal sources (size vs. maturity rate, for instance)? As an economist, I can't review everything in the animal sciences, yet I suspect the answers are basically in the negative. Yet, when we talk about selection indices for multiple trait selection, we certainly depend on weighting of individual traits by economic importance, a feat I fear we are not yet prepared to perform.

2. What is Energetic Efficiency?

While we have impressively lavished computers and sophisticated techniques in statistical genetics on the "heritability of feed efficiency," just what have we really measured! In time or age-constant, or gain or finished weight constant experiments we do indeed observe apparently large differences in gross feed or energetic efficiency. And, we can then go busily about our way at the computer-assisted number-crunching that results in all kinds of apparent heritabilities, correlations, etc. But, when we get through, what have we really measured? Have we indeed measured heritabilities of some fundamental, innate, biological trait in feed utilization? Or, have we only measured the interaction of a size and maturity genotype with an arbitrarily imposed feeding system? Perhaps we have only indirectly and inefficiently estimated the heritability of size or of degree of physiological maturity at the time the test was terminated. The much smaller--even negligible--differences in energetic efficiency observed when feeding is started and terminated on a fatness, carcass grade, or physiological maturity constant basis strongly suggest many of our apparent heritabilities of efficiency are merely indirect proxies for heritabilities of size or beginning or ending maturity or fleshiness. In some research, feedlot efficiency measures represent the inverse of pre-weaning efficiency--as the "best" are those with poor-milking mothers.

What is energetic efficiency? Can we partition the "gross" efficiency we observe into its components and determine the genetic variability and heritability in the population for each component? Is there real genetic variability in the efficiency of feed digestion? How much genetic variation is there in voluntary feed intake per unit of metabolic size--when maturity and fatness are constant? How much does maintenance requirement vary per unit of metabolic size among animals of the same maturity and condition? What are the true partial efficiencies in synthesizing fat and muscle, and do they vary substantially among the population? If these partial efficiencies of components of gain vary, do animals of same maturity and feed intake vary in composition of gain, or are the differences in composition of gain merely a function of varied voluntary intake per unit of metabolic size or of differences in physiological maturity? Once such components of efficiency are separately identified, quantified, and their genetic variability and heritabilities measured, are they mutually supportive--or do antagonisms exist? For instance, will the faster growing animal or the animal with a more favorable composition of gain carry a genetically corelated debit of a higher maintenance requirement per unit of metabolic weight?

Unfortunately much of the differences observed in feed efficiency reflect only that we fed some animals beyond their natural market weight, while others had not yet reached it. It seems a serious misnomer to imply that such gross efficiency differences represent inate genetic differences in efficiency.

I am not so naive or so unappreciative of the research of recent years as to believe we have no answers to these questions. Nevertheless, I do believe that many of the conflicts, confusions, naive understandings, and issues in selection cannot--repeat CANNOT--be resolved until good hard quantitative answers can be given and integrated in response to such questions! It's an awesome challenge.

3. <u>Fixed Costs are fixed to what?</u>

Fixity of costs or resources plays a large role in most concepts of efficiency. Generally, we improve efficiency by manipulating whatever is "variable" to get a larger product or net return from whatever is "fixed." Energetic efficiency in animals is a case in point. Most progress has come from obtaining a larger "variable" intake of energy to get more "production" relative to the "fixed" cost of body maintenance. Thus, we have selected for larger production and larger energy intake per unit of "fixed" maintenance cost. And, we've supported the un-naturally large milk production potential of the modern dairy cow with an un-naturally rich concentrate re-inforced diet. Unfortunately we don't have a very good analogue with the beef cow since her production is still the "natural" one-calf per year that nature originally intended, and that "survival of the fittest" equipped her to perform. Thus, an un-naturally enriched ration ultimately produces primarily an increase in the non-saleable product of cow weight and condition, rather than the large gains in efficiency enjoyed from today's "un-natural" dairy cow. But that's another story for another time and place.

The notion of resource or cost "fixity" is important in everything we do. We prefer to operate a feedlot to capacity to spread or dilute the "fixed costs." We seek more crop acres to reduce the machinery fixed cost on a per acre or per unit of product basis. In almost every economic decision, we are somehow trying to spread fixed costs over more units, or to increase or maximize product or return from a fixed package of resources.

Now, how is this relevant to beef cattle breeding? One of the major selection issues in livestock selection is whether to stress maximal performance or production per head--or per acre--or per ton of feed--or per pound of TDN. This leads us into a deceptively crucial choice of an accounting assumption. What are the major fixed costs in beef cattle production and what are they fixed to? When we summarize a rancher's accounts we classify a lot of costs as fixed (labor, property taxes, depreciation, interest on investment, etc.). A lot more "overhead" costs are really "fixed" from the standpoint of cattle production--such as fence and building repair and maintenance. We may report these on a "per cow" basis--such as "$50 fixed cost per cow." But, are these really fixed on a per cow basis when we consider differences in cow size? If they were, then production per cow would be important in and of itself. If, on the other hand, they are really "fixed" to a total ranch unit, then they are <u>variable</u> with respect to the cow when cow size is in question. The <u>smaller</u> the cow and her feed requirement, and the more cows the ranch can carry, the smaller the so-called "fixed cost" per cow--which has really become a "variable" cost for choice among cow sizes.

The same relationship holds for many of the so-called fixed or overhead costs in backgrounding or cattle feeding. If they are "fixed" for the business unit then on a per head basis <u>they are inversely variable with the number that can be handled within that feeding unit</u>. Cattle that require more space or that are on feed longer must be charged a larger share of such business "fixed" costs on a per head basis.

Thus, without belaboring this simple economic reality further, let it suffice to state that the seemingly innocuous and innocent convenience of reporting fixed costs on a per head basis can seriously mislead if it is carried at face value into economic evaluation of different sizes of cattle. Maximum return to "the ranch" is more relevant than maximum return per head.

Selection Challenges in a Total Systems Perspective

While the major thrust suggested by the title is the implications of a "systems" approach, the foregoing is believed to be a necessary--or at least a useful--preliminary to such a discussion. The importance of a "systems" perspective will emerge only after--or as--the over-riding concern of adequate size and gainability has been moderated--or as the "short stave" has been brought to (or beyond) optimal length. Only then will other staves in the barrel appear as the shorter or more limiting elements. Further, a "systems" approach will demand more precision and clarity in our understanding of various productive attributes such as efficiency, composition, maturity rate, "performance," etc. Further, it will demand more knowledge of how the pieces fit together, interact, trade-off, and mutually interconnect in a total system of production, and how each (and all) such relationships are affected by other building blocks in the system such as forages, climate, calving time, resource availabilities, etc.

As we approach the challenge of more systems-specific selection and description of breeding stock, the first problem will be to identify and describe differing systems--and perhaps identification of systems attributes most relevant in a particular trade territory or among a given breeder's customers. Then, the selection implications of these descriptions must be inferred. Without further ado, let's look at a few characteristics of systems.

●● How large are the clients' herds? What breeding systems are they likely to opt for?

Whether the commercial cattleman opts for use of specialized maternal lines and terminal cross sires has implications for breeds and breeders. Large average herd size may permit separate herds by ages and encourage use of specialized herds, with terminal cross sires used with older "maternal cross" cows. Or, the smaller average herd size of humid areas, or of a smaller breeder's most likely clientele, may encourage a three-breed rotation or even a backcross system in which a compromise of maternal, growth, size, and carcass is demanded in all breeds used. One thing is certain, all breeds and all breeders cannot exist producing primarily a "terminal cross" animal. Breeds and breeders will need--at some point--to choose the roles they expect their cattle to play in what kinds of systems for what kinds of producers.

●● What are the calving seasons and what are the labor-management availabilities at calving?

While some producers may fear calving difficulty like a plagure, others may feel they're "not challenging their cows" adequately unless they have to pull a few. The acceptable or optimal degree of calving difficulty will likely depend on season of calving. Some will opt to increase weaning weight per cow via earlier or cold weather calving and prefer to get an extra 50 pounds from an added month of age to getting it genetically with the associated increase in dystocia. Such a cold weather calver's ideal may be the shortest possible gestation (to reduce birth weight) combined with the longest, roughest, fastest tongue and easiest found faucets in the mother cow.

Others--particularly those lacking good natural protection and cover--may opt for later calving in better weather and hope to make up their age-at-sale disadvantage by a bit of the "large-bull small-cow approach."

Others may insist that the breeder exploit fully the imperfectness of the genetic correlations between yearling and birth weight. That such correlations are imperfect and can be exploited in selection is evident in the sire summaries most breeds have or are developing. In the last sire summary of the Angus breed, for instance, you could have picked a bull with an expected progeny difference of +47 lb. on yearling weight and -1.8 lb. on birth weight. Or, you could have chosen one with a -1.4 lb. yearling weight combined with a +4 lb. on birth weight. Despite a fairly hefty correlation on an average--enough genetic independence exists for very fruitful selection.

For some commercial cattlemen, intensive management at calving is not only possible, but profitable. For others, something approaching "benign neglect" may be optimal--either because of terrain, off-farm employment, scattered herds, cows per operator, or other better paying demands on his time.

●● What are the prevailing forage qualities and availabilities?

Different climates and soil qualities result in different forage qualities that are practical or optimal in an area. Certainly an alfalfa-brome mixture presents a different nutritive regime than stock-piled mature tall fescue. The question of optimal milk production levels probably hinges on forage qualities and availabilities--and season of calving. Beyond some level, extra milking ability becomes competitive with reproduction and calving interval. To be sure, supplemental concentrates can be employed to permit cycling and settling at higher production levels, but profitability is in serious question. More fundamentally, optimum milking level in the beef cow is determined by forage quality and quantity. Just enough cow condition to cycle and re-breed regularly probably indicates near-optimal milking ability--or an optimal match-up between genetic milk potential and forage quality.

●● What kinds of feeding-backgrounding systems?

Rather than varying by areas, regions, and climates, this refers to variance by time periods and market conditions. As indicated earlier, low beef steer-corn price ratios tend to encourage more backgrounding as feedlots find older, heavier cattle to be relatively more attractive. Range and forage operators find backgrounding a profitable alternative use of their forage resources. Less mature size is needed for these older animals to reach the 600 pound carcass threshold before becoming over-done.

In contrast, high beef steer-corn price ratios (such as the 30:1 ratios of early '79) make calves relatively more attractive (and valuable) to feedlots and such resulting price relationships as $1 calves and 80¢ yearlings quickly cause some backgrounders to consider starting a cow herd. As much younger, lighter animals are placed on feed, genetic size becomes relatively more important, as too many begin to finish at lighter than preferred weights. Or, the feedlot tries to feed them too long and the watchwords become "overdone and inefficient."

Unfortunately no one can forecast with accuracy just what the fed steer to feed grain price ratios will be five or ten years hence. If, however, we understand the cause-effect relationships underlying such shifts and adjustments in the industry, we can at least diagnose trends sooner and adjust with--and not years or decades after the fact.

●● What are the market preferences?

One of the supreme realities of today is The Box! Boxed beef places certain constraints on preferred carcass size. Whatever doesn't fit the "Box" for reasons of size, weight, or shape of cuts--sells at a disadvantage. The dominant packers (all too few!!!) seem to prefer (or can box) the 600 to 800 lb. carcass weight. It would seem that whatever mature sizes (or combinations) that finish at 1000 to 1300 lb.--on the most likely backgrounding-feeding systems--are about optimal. But, be alert to any future changes in technology, market tastes or grades, or to changes in backgrounding-feeding systems.

And despite negative genetic correlations between quality and yield grades, there are cattle of #2 yield grade that grade choice--or even prime and some 4's and 5's that still won't grade. Again, one of the greatest selection opportunities may be in fully exploiting the imperfectness of a correlation or association between traits. Consideration of a USDA grade change could, of course, modify selection criteria--if it is approved.

In the context of carcass attributes, an important question may be how antagonistic are the genetic needs for a successful "hay burner" who can consume enough rough feed to milk well and breed back--with the trimness needs of a carcass (or show) steer?

The "BOTTOM LINE": Economic Return

Specialization by academic disciplines in universities divides us into agronomists, economists, animal scientists--and even further into geneticists, nutritionists, etc. Yet--out on the firing line of a cattle operation it all has to come together in pursuit of something called profit. At times we "experts" must resemble blindmen trying to describe an elephant--based solely on the small portion of the elephant's anatomy each has explored.

To be sure--no one has any monopoly on the "The Big Picture"--including the economist--but all of us must attempt, at least, to follow our reasoning through to the bottom line of profitability--if we are to effectively advise the beef industry. Therefore, I'll offer a few suggestions:

•• Physical proxies can mislead.

Because we cannot select for "economic worth" directly, we are forced into selection for physical proxies that are hopefully related to economic worth. Weaning weights, yearling weights, calving interval, etc., are commonly employed, but such measures should be used only with full knowledge of their limitations and risks. Over-reliance on such physical proxies for economic worth can lead to inflated expenses, uneconomic improvements, and unintended side effects such as excess cow size, dystocia, poor reproduction, and other unplanned spin-offs from excessive single trait emphasis.

•• Optimum tradeoffs and combinations may be more important than "maximums" of anything. Genetic antagonisms do or can exist between milking ability and reproduction, yearling or weaning weights and calving ease, marbling and cutability, and perhaps between trimness in the market steer and the ability of his mother to succeed as a "hay burner." While maximizing may be more "dramatic," optimal compromises and tradeoffs may be more profitable for commercial producers.

•• Total systems comprehensiveness is needed to avoid taking two steps forward while falling back three. Blind emphasis on post weaning efficiency or feedlot performance may select for growthy cattle with poor milking mothers. Blind emphasis on weaning weight can encourage poor reproduction, or milking ability in excess of that supportable by quality of the forage, poorer post weaning performance of the fleshier calf (with price discounts by discerning buyers), or in increased calving difficulty. While many can't fully practice their selection on a conception to dinner plate basis, all can adopt a total systems perspective and attempt to evaluate traits accordingly.

•• Profit is a residual return to a total resource package. We don't survive economically because of profit per head, or per acre, or per pound. Profit is the total we have left net of costs to pay for the "fixed" resources we have available. It's the residual return we have left to "pay for the package"--which includes our ranch equity and our managerial effort. Whether we have a $30 per head net profit on 300 head or a $45 per head profit on 200 head makes no difference. Either case yields the same net ranch return for whatever resource package produced it. While it is easy to measure performance on a per head basis, a better guide to profitability would be performance per unit of use of fixed resources.

•• Physical proxies can be more economically relevant. A curious omission seems to plague our choice of selection measures. Two weaning weight or beef cow efficiency measures have been commonly employed--neither of which seems in harmony with either nutritional or economic reality. Table 1.0 and 2.0 demonstrate this dilemma.

TABLE 1.0 Alternative Herd Rankings of Three Hypothetical Beef Cows

	Cow A	Cow B	Cow C
Body Weight of Cow	900 lb.	1100 lb.	1300 lb.
Average Weaning Weight per Calf	450 lb.	540 lb.	580 lb.
Weaning Weight Index	86	103	111
Weaning Weight as a Percent of Cow Weight	50%	49%	45%
Metabolic Size of Cow ($W^{.75}$)	164	191	216
Weight Weaned Per Pound of Metabolic Size	2.74	2.83	2.69

TABLE 2.0 Estimated Total Ranch Productivity With Herds Composed of the Three Hypothetical Cows

	Cow A	Cow B	Cow C
Body Weight Index	100	122	144
Metabolic Weight ($W^{.75}$)	164	191	216
Metabolic Weight (and feed requirement) Index	100	116	132
Ranch Capacity in No. of Cows	300	259	227
Expected Weight of Calves Weaned with 90% Calf Crop	121,500 lb.	125,874 lb.	118,494 lb.
Weaning Weight Advantage vs. Cow A	0	+4,374 lb.	-3,006 lb.

If our selection attempts to maximize weaning weight per cow, Cow C would be our heroine, as her 580 lb. average weaning weight exceeds those of Cows A and B. On the other hand, if we use the cow efficiency approaches of some, and attempt to maximize calf weight as a percent of cow weight--or calf weaned per 1000 lb. of cow, our heroine is now Cow A, with an average weaning weight 50% of her own body size.

In the first case (maximum weaning weight)--we tend to select for ever larger heavier milking cows. In the latter case, our selection would probably favor smaller size, heavy milking ability, and early maturity.

I would contend that with a more appropriate use of both economic and nutritional concepts, we should be choosing Cow B, as superior to either A or C! First, the primary economic fixity is the feed base--or--"The Ranch." Most other so-called fixed (or overhead) costs are really fixed to the total resource package--and not on a per cow basis. Thus, ranch profit is more likely to be maximized by which ever cow type will produce the most weaning weight (assuming no difference in sale price) per unit of feed or proportion of the ranch used. Applying nutritional concepts, if maintenance requirements (and feed requirements) are proportional to the "metabolic" weight of the cow (or $Weight^{0.75}$), then we should attempt to maximize the product produced per unit of metabolic cow weight ($W^{.75}$). As can be seen in Table 1.0, Cow B excels in this measure with her 2.83 lb. calf weaned per lb. of metabolic size.

Carrying the analysis on to a total ranch basis, Table 2.0 uses the metabolic weights of the three cows to establish a metabolic size (or feed requirement) index with Cow A used as the base with a 100 index. Cow B, while 22 percent larger in size, is only 16 percent larger in metabolic size--thus her 116 index. Cow C, while 44 percent heavier than Cow A, has a metabolic size index of 132--and is thus expected to require 32 percent more feed. Expected carrying capacities of a "300 cow ranch" (of Cow A's size) are 259 cows of B's size and 227 cows of C's size. Finally, expected total calf weights weaned are calculated assuming a 90 percent calf crop--with Cow B having a 4374 lb. advantage (over "A" cows) and Cow Type C showing an expected disadvantage of -3006 lb.

Note that absolute weaning weight selection would pick "C", percent of cow weight weaned would pick "A". Yet, if feed requirements are at least crudely related to the .75 power of body weight (metabolic size), and if most fixed or overhead costs are fixed to the ranch unit, then both selection criteria picked the wrong cow. The top cow should have been Cow B--with the largest production per unit of metabolic size. Why have we been so slow to "use all we know"?

No doubt some reluctance in using this approach traces to difficulties in calculating or explaining metabolic weights. Such a reason no longer seems valid. First, I can teach anyone how to calculate metabolic size on a $20 calculator in five minutes! Second, in a day when "expected progeny differences" and other sophisticated concepts of theoretical and statistical genetics are being bandied about, this concept, by comparison, is "child's play"! If weights produced, and rates of gain are to be meaningful from a feed efficiency and economic standpoint--they simply have to be related to maintenance requirements or to metabolic size.

This, then seems to promise a purely physical measure that makes both economic and nutritional sense. If we must use physical measures as "proxies" for economic worth--<u>why not use those most related to economic worth</u>?

A Brief Summary

The misguided showring selection of the 40's and 50's presented the cattle industry with a tremendous need and cattle breeders with a great opportunity. Outstanding progress has been made in remedying the resulting "short stave" of the too small cattle. In many cases we have gone the right direction for wrong reasons. As we approach a more optimal cattle size, we will need to both re-define a set of new "short-staves" to be remedied, but also to clean-up or correct our wrong reasons--that they not lead us in wrong directions tomorrow.

In particular, we need to better understand the causation and component parts of the gross efficiency differences we observe. Differing gross efficiencies resulting from truly genetic differences in digestion, partial efficiencies, or in maintenance requirements per unit of metabolic size beg careful identification and use in selection. Efficiency differences that are man-caused as we feed some beyond their appropriate market weights while others are still immature and "green" are a quite different matter. Such genetic size-feeding system interactions have more management than genetic implications--other than the need for adequate size to finish at preferred weights.

The eventual attainment of optimal size will open the door to a more total systems related selection. Our concepts of an ideal animal will differ by climates and regions and become more systems-specific, as our selection is tailored more to trade area and likely clientele. Typical herd sizes, forage qualities, calving seasons, selling times and ages,and resource availabilities will increasingly influence selection emphasized by different breeds, breeders, and localities. Shifting price relationships (beef vs. feed grains) will also affect systems actually employed, and thus the mature sizes desired.

Finally, the bottom line is economic. We will indeed continue selecting for physical proxies, but hopefully we will increasingly harmonize these physical measures with total systems, and with economic and nutritional realities. Relating performance parameters to some measure of metabolic size would be a very useful step in that direction. Maximizing product per unit of metabolic size recognizes the fixed energy cost of "maintenance"--and also the fixity to the ranch or total feed base of most so-called fixed or overhead costs. Cheap electronic calculators make it easy to do, and by comparison to other sophisticated genetic and statistical concepts now employed, it is a comparatively simple concept.

While the future may be more complex and challenging, it will not be dull. It will be an exciting time to breed beef cattle.

FITTING CATTLE TO SYSTEMS:

An Action Plan

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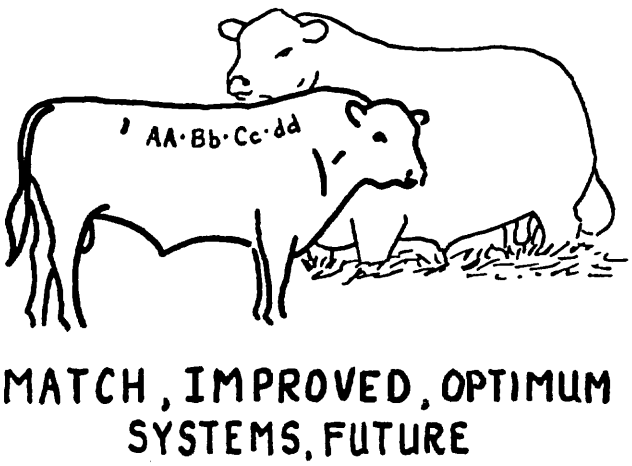
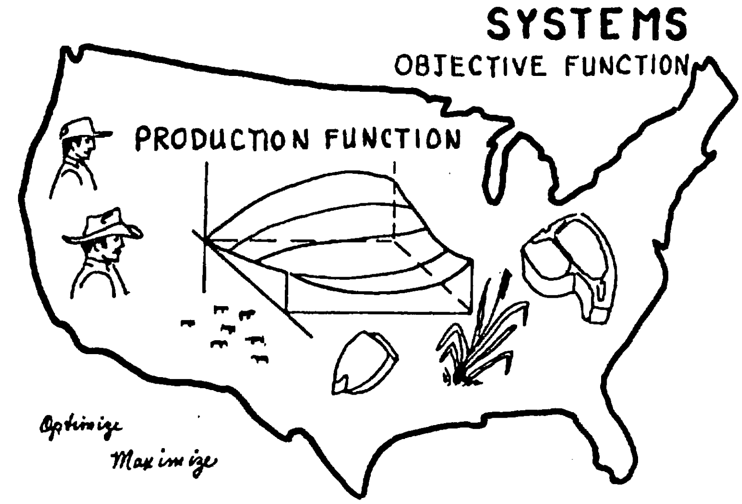
"Fitting cattle to systems" sounds like a return to the time when the eye of the herdsman fit the "bark" and hair of each animal in the show string for the all important show circuit. These individually handled animals were selected near birth on signs of early maturity and represented the product offered for sale by the affluent breeding establishments. These cattle were fit to the existing "system"! The intent of this paper is to go "gene" deep under the bark and hair to match improved genetic potential to available resources in optimum systems of beef production now and in the future. The stark contrast between then and now represents genuine involvement by agricultural scientists in the dynamics of our beef industry. The current state of the beef industry suggests the need to deal in basics, so competition can be met effectively. The key words of this paper are match, improved, optimum, systems, and future.

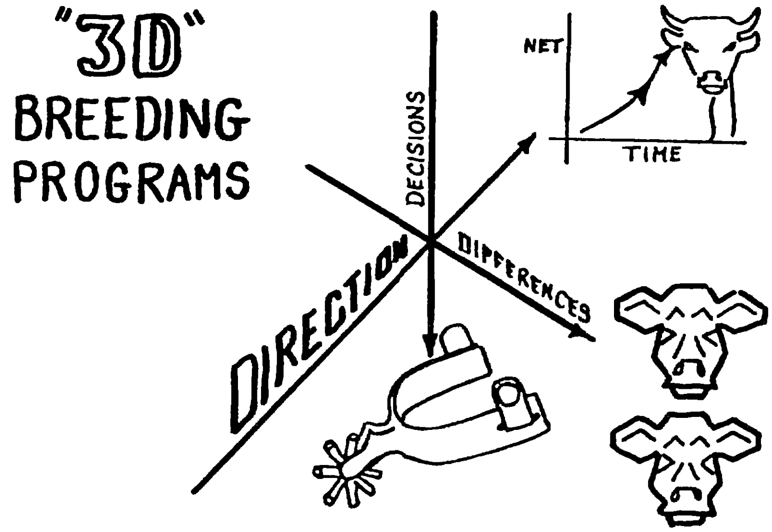


A system is a set of interdependent elements that form a collective entity. Thus, the beef system is composed of a set of interdependent resources that include land, labor, capital, etc., and a biological population of bovines that form a collective entity for the production of the product, beef. The varied operators of the total system require a monetary return. Segmentation of the beef production system is real. An operator in the chain wishes to maximize his objective function or the difference between output and input in monetary terms. The particular production function or the relationship among inputs and outputs governs the system conduct. Within a given set of resources or constraints an operator by varying his activities can maximize his objective subject to the biology of the production function. It is to this function (production function) that the key words of this paper refer. That is, improving the biological



population of bovine such that judicious inputs from subpopulations in ordered combination will match the other resources utilized to optimize the production functions for specific systems, especially in the future. This is the domain of the breeder selling to producers of the total beef system.

The purpose of this paper is, in the context of a breeding program, to define the necessary design elements to produce a product (breeding animals or their surrogates) that fits optimally into one or several beef production functions as well as decide on the particular system to produce the product. Attention is focused on breeding stock programs.



BREEDING PROGRAMS

Consider first the basics in the design of a creative breeding program. The general breeding problem is to select and combine germ plasm that results in superior stock to that previously produced. What can be combined is circumscribed by what can be incorporated biologically. The definition of the problem indicates that the only directional force available to the breeder is selection. The relation between the problem and the concept of breeding value or the value of germ plasm as parents is evident. Also from the problem statement flows the definition of a breeding program.

A breeding program is a complete management system that is designed and conducted to bring about directional genetic change. The program must include the specific production system under which a sub-population of bovines are changed genetically. Depending on the type of program, the production systems to which the product offered for sale is to be relevant must be studied and defined as part of the direction choice.

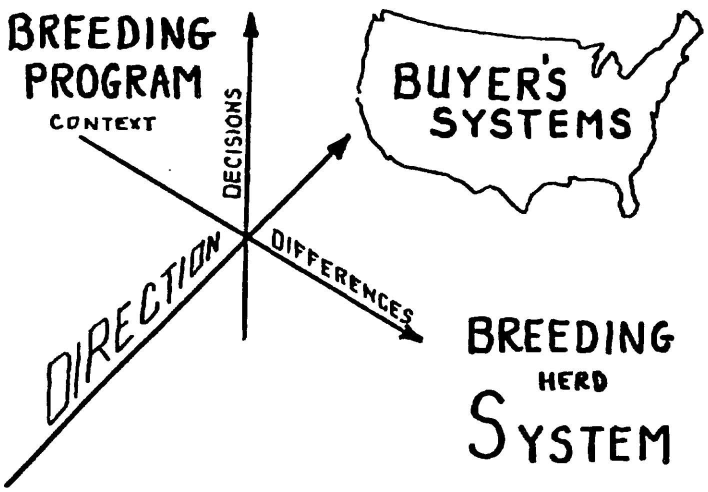
The form of most breeding programs is cyclic with one round of genetic change being layered on the previous round. The cycle involves the production of a set of offspring, their evaluation, and the selection of parents to produce the next offspring set. The order in beef systems for any one year is the calving of a set, the yearling evaluation of the previous set, the selection of the next parents, the breeding of these selected individuals for the next set, and the weaning evaluation of the current set. This cycle is repeated yearly over time. Genetic change in the sub-population is the cumulative differences between the adjacent sets of calves. This assumes no environmental fluctuations, so other methods of evaluating genetic change must be used.

In the total beef production system there are essentially two types of breeding programs. They differ in the product offered for sale and in the forces available to the breeder to make genetic change. The breeding herd program sells breeding value or the value of his product (parents) in the herds of his buyers while the commercial beef producer sells numbers and pounds however these can be obtained. This leads to a difference in the forces available. The breeding herd program can only utilize genetic differences that contribute to the variation usable by selection while the commercial program can incorporate genetic differences existing among cross combinations of sub-populations or breeds and thus can select among groups to increase heterosis advantage and incorporate real performance differences among animals in the breeding herd and those destined for market as well as select representatives of these groups as parents that are superior in their group. That is, the market animal of the commercial program does not undergo segregation and subsequent recombination in its offspring as does the breeding stock before its value is determined.

Because selection is the only directional force available to breeders to change the genetic composition of their biological populations (herds), there are really few choices open to the breeder in his design of a breeding program. These choices are three dimensional. They are direction, differences, and decisions. The paramount choice and the first that must be made since it influences the others is direction. The word direction is used rather than goal since this implies a fixed object of reference. Really a breeder is making directional change in the mean performance of a biological population in time and space. There is no fixed object at the end; there is no end in adaptation of livestock to systems of production that benefit man.

The second choice of the breeder involves the evaluation of each set or calf crop and the parents. The measures chosen relate to the direction. The word difference implies that only differences among animals treated alike are relevant. Variation or difference is the raw material of the selection process; there is no other.

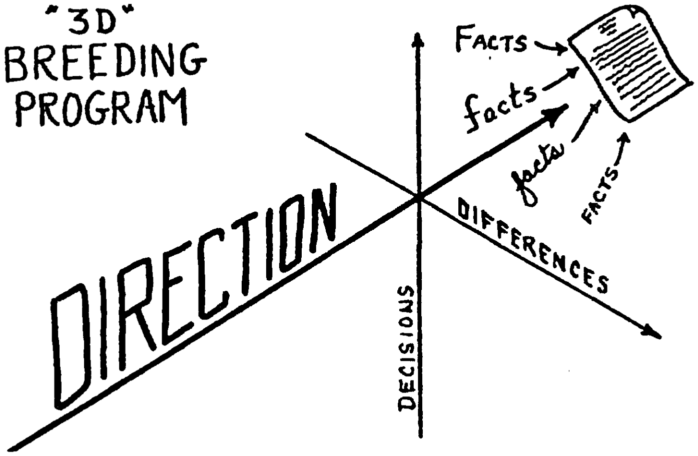
The third choice of the breeder concerns selection decisions to be made based on the differences to move his sub-population in the chosen direction. This choice depends first on the direction decision. The traits of major importance to optimizing his production function or if a breeder to optimize the production functions relevant to the herds of his buyers really define the selection scheme which may include a mating design of the selected animals.



With the three choices defined, each in turn needs examination to fit creative breeding programs in the context of the total beef production system and specific systems of production. As noted earlier, attention will focus on breeding stock programs.

DIRECTION

Direction, especially for the breeder selling breeding stock to the commercial producer, is the paramount and first choice necessary in the initial design stages of developing a truly creative breeding program. First, there is no substitute for putting things on paper. Talk, especially dreams, is cheap. Until breeders begin to define clearly their direction do they realize how nebulous their ideas have been. The same is true for all of us involved in the industry. Probably the most important result of the recent work on beef systems is to lay bare the areas of importance in which nothing is really known.



The key to good direction choice by breeders is to gather all the available facts on which direction depends and then integrate these into a working definition. Production functions that relate outputs to inputs for definable beef systems are the necessary facts. Few really good comprehensive production functions are available. Such multi-dimensional response surfaces are not easy to develop even for very simple systems. Then to use these production functions in the maximization of the objective function where prices (economic inputs) become involved adds another dimension to the list of necessary facts.

One way in which the facts necessary for real direction making could be developed is as follows:

1. Develop production functions for each particular beef system that include the major traits of the cattle population being used in the particular system.

2. Develop companion objective functions for each particular system that include current costs of the non-cattle inputs, the prices for the produced products, and the mean performance levels for the major traits.

3. Maximize these objective functions solving for the costs of the major traits using the production functions and constraints of the average firm in ordinary linear programming procedures.

4. Use these costs to establish relative economic values for the major traits of the cattle populations being used in the particular systems.

Such a procedure is reported in Milton et al. (1979). This is but one possible way to develop facts for breeders so they can make informed decisions concerning their direction. Such facts once developed are likely to show the following things:

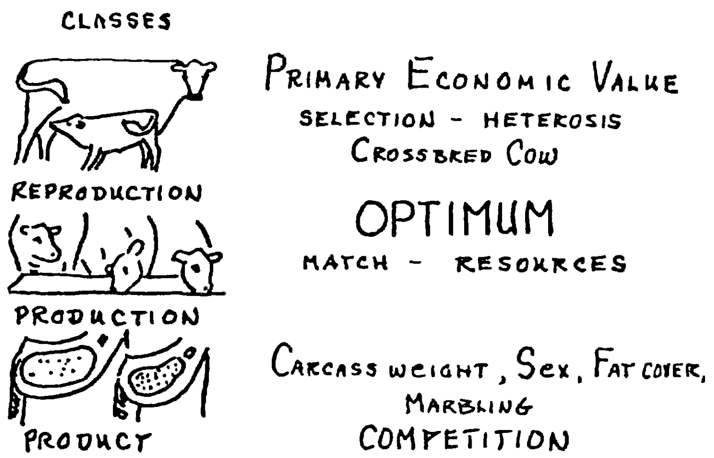
1. That reproductive performance in production systems that create new wealth (calves) will be primary in economic value. And we already know that selection is relatively ineffective while crossing breeds in the production of brood cows produces real economic heterosis in their reproductive performance. Therefore, breeders that are merchandizing breeding stock to commercial producers must incorporate into their programs the use by their buyers of crossing. Selling breeding value for reproductive performance in commerical bulls to be used in crossing to produce commercial heifers will require new evaluation procedures.

2. That production traits involving growth and development and milk production may well be important economically but may be optimum values rather than the traditional extremes. If this is true, the show ring as a means of evaluating size is completely out because animals can only be lined up from small to large or large to small. The genetic trends over the last 14 years for yearling weight in the Angus and Hereford breeds may need to be slowed as the results from the integrated systems approach begins to put traits that respond

easily to selection in their proper perspective. Further, milk production levels and their effect on reproduction when evaluated in systems with different resource constraints will surely be a primary issue.

3. That the future price relationships concerned with carcass weight, sex, fat cover, and marbling will have genuine repercussions in many beef production systems. Optimum cow weight and optimum crossbreeding systems may need re-evaluation by the industry. Competition in the market place among meats may have an impact; at the least the frills of the industry can be eliminated.

Of major concern to the breeders in their choice of direction, is the future and its correct prediction. Making compounded genetic change over time can be a slow process at best. Therefore, producing breeding stock that will meet anticipated industry needs is necessary. The systems approach may not be useful in their economic aspects but the biology of the production functions are much more stable and useful in future prediction. As always, profit is being first. When all adopt a given technology it becomes survival.



Now to the key aspect of design of breeding stock programs. The market for the product offered for sale (breeding value) is the production systems being used by the buyers of the product. For many years during the purebred epoc, the relationship between the seedstock herds system and the systems of the beef producer was minimal. Pampered, individually fed animals with abundant nurse cows typified the moneyed purebred circuit. Let us hope that embryo transfer does not serve as the perfect nurse cow again. Since many pioneers in performance evaluation were tuned to commercial production, many elite breeders of today run their operations like the commercial producers in their area. Possibly the generated production functions and the objective functions will when the objective function is maximized and the economic values established give the breeder facts concerning the range of specific systems his product has relevance to. If a general set of economic values can be established, specific breeders can serve a larger market than just one specific system needs.

There is no question that the breeding herd merchandizes breeding value of his stock. Specification of product offered for sale is becoming standard practice in industries such as beef production even when the product offered is biological and will always be subject to the variation inherent in the system. Selling on measures of breeding value are a reality in the beef industry. The problem today concerns the relative economic importance of the traits contributing to the production functions or how the breeding values need to be combined into an index of net merit. Also, not all the necessary breeding values are being calculated currently. As within herd mixed model analyses are conducted to simultaneously evaluate contemporary groups and expected progeny differences of all animals in a herd, this evaluation of one-half of the breeding value will provide breeders with much better breeding value estimation than is now being done. Possibly more traits can be included in such evaluations.

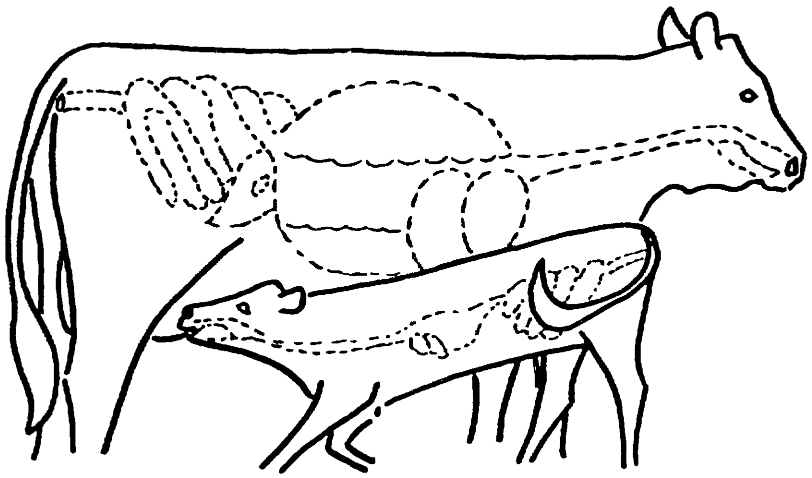
These within herd mixed model analyses can be tied together through the common sires used to give expected progeny differences that are comparable across herds. This will make possible the comparison of yearling bulls across herds so bulls can be used at younger ages. Besides these advantages the analyses will also provide an evaluation of genetic trend in herds. These breeders can truly promote their creative breeding program rather than specific sires as has been done all to often in the past. Commercial producers should be able to select breeding herds that produce germ plasm meeting their needs maybe even in more than one breed that the producer needs in his breeding program.

DIFFERENCES

The second choice of the breeder in the design of a program concerns the measurement and evaluation of differences among his stock for the traits he has determined are important in his chosen direction. Now these traits and their relative economic importance relate to the production systems of his buyers, the commercial beef producers, yet the breeding herd has to have a production system that minimizes the costs of production so the objective function of the breeder can be maximized. For many breeders the available performance program, with its BIF specified set of tests, of their breed has determined their production system. Serious study needs be given to this problem. We in BIF have assumed that the standard performance program fits all and consequently have said that really only one production function is relevant to the gigantic beef industry sprawled all over our continent. Time of weaning varies by region of the country. Stocker programs exist. We know already that our assumption is likely not true, yet large volumes of data of a comparable nature are necessary to conduct nationwide sire evaluation as is now being done. To achieve across herd evaluation, some uniformity of record-keeping is essential. One of the reasons for the formation of BIF was to encourage uniformity.

Breeders need to seriously consider the needs of their customers and incorporate evaluation of differences among their stock for traits concerning these needs. That is, evaluate differences for the common traits used in across-herd evaluations so that the breeder knows his relative position among competing herds, but also include the evaluation of differences not recorded in current performance programs if these are relevant to the customers.

The determination of exactly what production system to use by a breeder is a matter of question. The safe bet today is to use the common system being employed by the customer. However, several selection studies that have selected for the same trait in lines under different levels of feeding have produced some interesting results for consideration. Selection for gain under restricted feeding has given germ plasm that out-performed the germ plasm selected on full feeding even when full feeding was used. Clearly the most pressing question to be answered concerns the utilization of the rumen by beef cattle and the selection of stock superior in this ability, yet we test our animals on concentrate feeding even though there are roughly four animals in the breeding herd (using their rumen) for every slaughter animal.



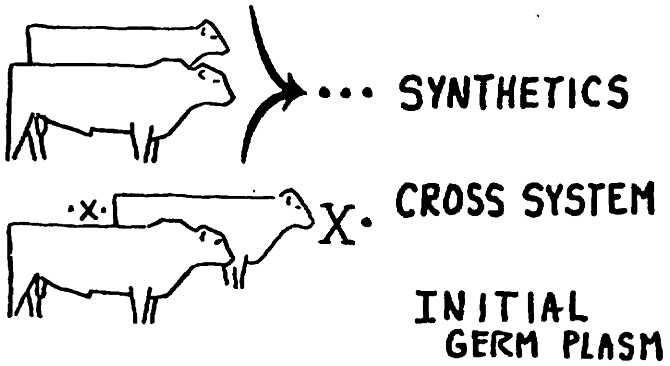
One still suspects that loosing the evaluation of milk production through the use of a nurse cow has hampered milk production in some breeds. The evaluation of maternal performance is also lost through embryo transfer. A generation or two of transfer and height may be all that is left.

Determination of the production system in which differences among breeding stock are evaluated is one of the primary choices of the breeder. Commercial producers have fewer considerations since they are developing a program to improve their production function and as a result their objective function. Their buyer is concerned with numbers and pounds. If their germ plasm suppliers are performing well, fewer records may actually be needed.

DECISIONS

Decisions constitute the final choice open to the designer of a breeding program. The breeder must design a selection scheme that utilizes the differences evaluated to move his herd in his chosen direction. Selection concerns the choice among groups such as breeds as well as the selection of individuals of a breed for parents. The scheme must also be concerned with how the selections are mated to generate the next genetic sample or calf crop. The breeder of breeding stock traditionally has developed a program only after the breed was chosen. Today, breeders are becoming involved with

DECISIONS: Selection Schemes



more than one breed with the purpose of serving their commercial producers using both breeds in a cross combination. Other breeders are in the process of combining germ plasm from breeds they believe can compliment each other and in combination the mix is being developed through selection of parents into synthetics or new breeds. The hope is that there will be retention of a fraction of the heterosis as well as the complimentarity.

Commercial producers have the task of developing a systematic crossing system using several breeds or the new synthetics that will provide stock that matches in genetic potential the resources available for the production function of their system. This is no easy task because the comparative breed evaluations must be studied in depth and then the sources of such germ plasm must be researched. Couple this to the fact that the breeds are evolving over time and specific sources (breeder herds) may not have breeding stock that is typical of the breed when it was evaluated comparatively. Need does exist to continually evaluate genuine samples of the breeds in cross combination so the producer can have accurate information with which to design his program.

Thus, the first development in the decision making choice is the selection of the initial germ plasm and its use in systematic crossing schemes if the producer is commercial. Often this decision accounts for the biggest single jump in the efficiency of the production function.

Next comes the design of the cyclic selection scheme especially for the breeder of breeding stock. Selection schemes to maximize the possible rate of genetic change can be divised. The given restrictions of the chosen production system for the herd provide the bounds of the problem.

The first concern is the use of the available differences to develop the best predictions of breeding value for all the possible parents. With the advent of within herd mixed model predictions that use the relationships between every animal with every other animal in the herd much better predictions will be available. Thus as these results can be tied across herds by the use of progeny from sires use extensively in the breed, the door will open for breeders to be able to fairly compare all bulls, including theirs, as if all the bulls had progeny in their herd. The intensity of selection on the sire side can be dramatically increased in herds tied to the breed sire evaluation by the use of evaluated sires.

A breeder can be conducting his own breeding program without real use of outside sires, yet the use of an outside sire with say 10 to 20 progeny each calf crop in fair comparison with the sires of his program will become paramount in general decision making in the breeding program. When the herd is in comparison to the others for the traits involved in the direction of the breeder, this will help in deciding whether to begin a linebreeding program to concentrate the blood in the herd or whether to continue incorporating superior germ plasm wherever it is found in the breed.

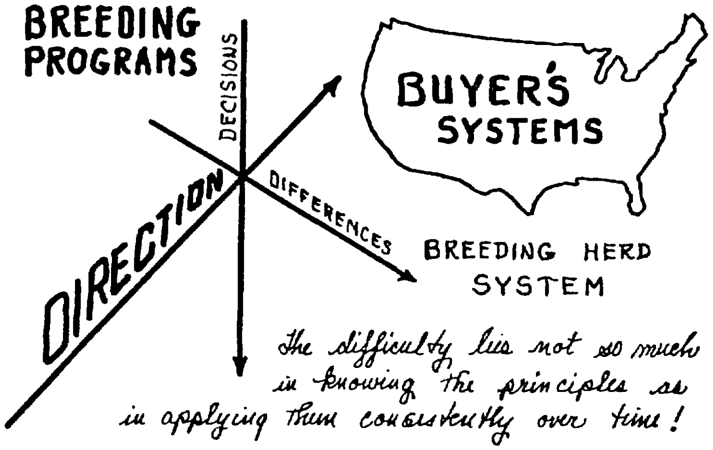
When breeders whose stock is relevant to the production of crossbred females for commercial production begin to seriously consider improvement in the reproductive complex attention needs to be given to the long-time limits of selection and ways to maximize the limits (maybe even two calves per year). This will be necessary since nature has selected for fitness, as measured by the germ plasm contributed to the next generation by individuals, for eons of time and the selection limits may indeed be near. Little genetic variation remains.

Selection of parents is the only directional force available to the breeder to bring about genetic change in any economically important trait. Therefore, whatever the effectiveness of selection is (low heritability) selection will be used. This is why so few real choices are open to breeders in the design of their breeding programs. Knowledge concerning the heritability of the traits of concern allows the breeder to design the most effective schemes to make genetic change. Own performance is the criteria for highly heritable traits while for those with low heritability the use of relative averages becomes very useful in the prediction of the breeding value of an individual.

The design of the decision-making process or the selection scheme to adapt requires knowledge of the basic principles of animal breeding. Much too much time is spent by breeders in planning each mating. Many times a result of this effort is to bias the needed sire comparisons made in subsequent calf crops because dam differences are included in the expected progeny differences of the sires being compared. Young sires have a difficult time beating their sire when he is mated to highly selected dams.

SUMMARY

The design of creative breeding programs is the context in which concepts of production systems for beef are integrated. The paramount choice of the breeder or direction is the most concerned in producing breeding stock of commercial relevance to a system. Maximums for traits probably are not the direction as they seem to have been in the history of beef breeding. Clearly, today there is real need to design on paper breeding programs having real direction of relevance to systems of beef production. However, as Sewall Wright stated so succinctly in 1920, "The principles of the successful breeder have been exceedingly simple," (the concepts are easy to grasp). --- "The difficulty lies not so much in knowing the principles as in applying them," (consistently over enough time to make genetic change).



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ANALYZE THE SYSTEM

J D Mankin
Extension Animal Scientist, University of Idaho

Beef cattle will respond in a given environment to the limit of their genetic capability or to the limits set by the environment. The environment is everything that interacts with that beef animal.

These interactions form two broad systems. The abiotic system is made up of such factors as heat, cold, wind, solar radiation, etc. The biotic system interactors are those forms of life that impact the animal such as disease organisms, plant life, other animals and of course man.

In beef cattle production man is the organism that has the greatest impact. The decisions that man can make influence all of the effects of either system.

An example of how his decisions can influence the effect of the abiotic system would be to provide housing by building a shade or the influence of economics. I am sure that you can think of many more examples. An example of how his decisions can alter the impact of the abiotic system would be a worming program or a nutrient supplementation regime.

This means to me that in beef production we have cows, bulls and calves with certain genetic potential. They have to exist and produce in an environment that consists of two broad systems. The production that is generated from this environment is limited more by the environment itself than the genetic potential.

In the BIF Guidelines there is a chart that indicates that at certain levels of production there may be limited genetic gains to be made. As previously stated, man and his decisions are the dominant influence in the environment. We call this management.

Performance records in commercial herds provide producers with information for maximizing growth management of their herds as well as individuals within their herds. These records can be used to pinpoint factors in the environmental system that can be changed so that growth potential will be maximized and potential profit increased.

Beef production at the commercial cow-calf level defined in the simplest terms is "growth management." A beef animal starts to perform the moment it is conceived. It continues to perform from that point until it is consumed or dies. However, growth in itself is meaningless unless set in a time frame. The amount of growth achieved in a given time period should be measured through COSTS and RETURNS.

Growth management can be broken into two segments: (1) the management of genetic material to maximize growth, and (2) the management of the environment to maximize growth.

If we agree that we must manage the environmental system to get the most growth economically possible, then we must learn how to analyze that system.

There are four KEY INDICATORS of the level of production in a seasonal calving commercial herd.

The first of these, and the one that has the largest economic impact, is OPEN COWS. If it takes $350 plus to keep a cow for a year, it doesn't take long to figure out that 15-20% open cows will knock a large hole in the budget. The number of open cows is a record that anyone can keep. You certainly don't need a sophisticated computer program to deal with those candidates for the golden arches.

The second KEY INDICATOR of level of production is the LENGTH OF THE CALVING SEASON. In those herds that do not have a seasonal calving system, days from the last calving or calving interval is the KEY INDICATOR. A long calving season is probably one of the biggest robbers of income on most beef operations.

In Idaho last fall we conducted a survey for open cows. The results are rather interesting. We asked six clinics to work with us involving 13 veterinarians. These clinics were across southern Idaho. The following table summarizes the overall results.

Total cows and heifers-----------17,378
Percent open----------11% (Range 0-35%)
Percent calving in first 40 days----46%
Percent calving in second 40 days---28%
Percent calving in 80+ days---------15%

The open cow problem is about what you would expect. The problem becomes much more serious when you combine those that are calving 80+ days into the calving season with the 11% open. You are looking at roughly 26% of the cows as failures. Certainly failures in terms of paying bills with those light calves.

In the summary we see that less than 50% of the cows will calve in 40 days. This is important, when you realize that for each day one calf is younger than another it will be 1.5-2 pounds lighter in weight. One heat period represents 30-40 pounds. When translated into dollars, a long calving season becomes the biggest "robber" in the beef industry.

The next KEY INDICATOR to analyze is CALF DEATH LOSS. These losses range from 2-3% up to 25-30%. The reason for the wide range is that it varies from year to year and how honest the reporting. We are beginning to get a handle on this in Idaho. Preliminary indications are that over a period of years the baby calf losses will be 12% plus. Nationally I would daresay that baby calf losses will be 12-15%. This is only my guess. I think it is very important that we find out where this KEY INDICATOR of production level is.

The fourth KEY INDICATOR of production level is GROWTH. There are two systems that contribute to growth. Within the operation there are two systems that can impact growth. As I said earlier, beef cattle management is really growth management. Growth being the major product we sell, it is important that we realize that total growth of the herd is a composite growth of the individuals and the total growth produced by the herd. If you will allow me to separate the two, the individuals growth is a product of the breeding system, and the total herd growth is a product of the management system. It is the management system that sets the limits of tolerance for open cows, length of the calving season, death loss, and minimums of growth.

Now, if we analyze the production system from these four KEY INDICATORS, there are only about four KEY CAUSES of variation in levels of production in each of these. Let's run an example of open cows through the systems analysis and see what happens.

NUTRITION is usually the first cause that comes to mind. This is legitimate because nutrition is without doubt the most common problem in getting cows to breed. We used to call it "hollow belly," but we are more educated now, with more ruminant nutritionists around it now has a scientific name "lackus feedosis."

The second thought that comes to mind is DISEASE. There are some diseases implicated in the open cow picture. Most of the health problems can be dealt with very successfully. Another problem in open cows is the BULL picture. Sometimes they are not as fertile as they could be, nor as young, or as sound as they once were. Maybe there is not enough bulls for the terrain. There are a number of reasons why the bulls could be the cause of open cows.

We can't get MANAGEMENT or environmental manipulation out of the picture as a possible KEY CAUSE.

What is the next step in analyzing the system? Let's take one of the possible KEY CAUSES, DISEASE, and follow it through some steps of the analysis flow. We have said disease could be a KEY CAUSE. There must be some key things to do to determine the possible cause of open cows in relation to disease. As far as disease is concerned, there are two things we can do. We can give the cows a physical examination to determine their fitness and give them a clinical exam to determine if disease is implicated. If disease is implicated we should come up with an answer after the two examinations. For example, let us say there were no problems in the physical. The clinical exam revealed that Vibrio was probably the key problem. The next logical step is to recognize that a change in the system of management needs to be made. The KEY CHANGE would be a vaccination program for Vibrio.

We should be able to measure this back against the base data for some KEY RESULTS. In this case it should show up as a decrease in the number of open cows as a KEY INDICATOR of production level.

We demonstrated this systems analysis approach on two projects in Idaho. One was the Pegram Project in southeast Idaho where the KEY INDICATOR, baby calf death loss, was reduced from 16% to 2% in a three-year period. The other was the Boise River Project, (A Method & Result Demonstration), where the problem was open cows. At least that was the point of trauma to the rancher when 23% of 350 cows were diagnosed open. Fortunately this rancher had two years of herd records. He had--in addition to 23% open cows--a 140-day calving season, 7% death loss in calves and 352-pound weaner calves at about 250 days on irrigated pastures. By going through this process on each of the four KEY INDICATORS, we discovered that the major causes were selenium and copper. The KEY MANAGEMENT change we made was a mineral supplementation program. He came out this past year with 93% conception, 60-day calving season, and 1.5% death loss. Weaner heifers were 87 pounds heavier and steers 60 pounds heavier than the previous year. For more complete detail, see the attached flow chart.

In summary---We are the largest impactor on the production of our ranches because we manipulate the environmental system through our management system. We must have a system of analysis on the KEY INDICATORS of level of production. We must be willing to change. All of the technology in the world is useless until it is incorporated into the management system. Seldom will we be successful unless we use a interdisciplinary approach. In Idaho we call it the Total Beef Program, nationally it is called Integrated Reproductive Management. You who are producing cattle need to obtain all of the technology available and incorporate as much as you economically can. Those of us in education need to be innovative in our efforts to speed the rate of technology adoption.

BOISE RIVER EXTENSION PROJECT

(A RESULT & METHOD DEMONSTRATION)

300 HEAD COW HERD

FLOW CHART OF TBP APPROACH

DATA BASE	KEY INDICATORS	KEY CAUSES	KEY APPROACH TO PROBLEM ISOLATION	KEY PROBLEMS IDENTIFIED	KEY MANAGEMENT CHANGES	KEY RESULTS
PERFORMANCE RECORDS	OPEN COWS (23%)	DISEASE	PHYSICAL EVALUATION CLINICAL TESTS	NO PROBLEMS NO PROBLEMS		
		BULLS	PHYSICAL EVALUATION CLINICAL TESTS	1 GIMPY NO PROBLEMS	SOLD 1, GIMPY	
		NUTRITION	FEED ANALYSIS CLINICAL TESTS	LOW SE, CU, CA, P LOW SE, COPPER	SUPPLEMENT SE, CU, , P.	93% CONCEPTION
		MANAGEMENT	REVIEW MGT. PROGRAM PARASITE CONTROL RECORDS-SUMMER PASTURE	HIGH FLY POPULATION	ECTRIN EAR TAGS	LESS FLIES
	CALVING SEASON (140 DAYS)	DISEASE	PHYSICAL EVALUATION CLINICAL TESTS	NO PROBLEMS	VACCINATION PROGRAM	60-DAY CALVING SEASON
		BULLS	PHYSICAL EVALUATION CLINICAL TESTS	NO PROBLEMS		
		NUTRITION	FEED SAMPLES CLINICAL TESTS	LOW SE, CU	PREG TEST -CUT OFF LATE	
		HEIFER DEVELOPMENT	CHECK FOR SIZE, AGE, CHECK PERF. RECORDS	50% LARGE ENOUGH TO BREED	ONLY HEIFERS OF SUFFICIENT SIZE KEPT & BRED. BULLS IN 1 HEAT THEN PREG TEST	
	CALF DEATH LOSS (7%)	DISEASE	NO CLINICAL SIGNS OF DISEASE		COMPLETE VACCINATION PROGRAM +BOSE	REDUCTION OF 5.5%
		NUTRITION	NURSING	SUPPLEMENT	SUPPLEMENT	
		MANAGEMENT	SAME AS COWS			
	GROWTH 352 LB W/W, 232 DAYS/AGE	NUTRITION	FEED ANALYSIS LEVEL OF FEEDING	LOW SE LOW COPPER	SUPPLEMENT SE, CU	HEIFERS 87 LB HEAVIER THAN 1981 STEERS 60 LB HEAVIER
		PARASITES INTERNAL & EXTERNAL	EXAMINE FOR EXT. INT. PARASITES	HIGH INT. POPULATION. SOME EXT.	WORM CALVES POUR ON	
		DISEASE	CHECK FOR CALF DISEASES	SOME BVD, PI_3 IBR SUSPECT	VACC. PROGRAM FOR CALVES	
		GENETICS	EXAMINE PERFORMANCE RECORDS OF COW HERD & HERD BULLS	VARIATION IN PERFORMANCE	COW EVALUATION & CULLING	

KEY ACTIVITIES TO ADOPTION

INFORMATIONAL (MEETING)

A. DISCIPLINES REPORTED WHAT EACH CONTRIBUTED TO PROJECT RESULTS

B. PROCESS OF TBP-APPROACH EXPLAINED

C. LIST OF PRODUCERS PRESENT OBTAINED- (70 PRODUCERS PRESENT)

D. NEWS MEDIA PRESENT- RADIO, TV, PRESS

E. NOTICES OF MEETING SENT TO LIVESTOCK PRODUCERS ON THE BOISE RIVER

F. PUBLISH COMPLETE REPORT OF ACTION ON PROJECT.

FOLLOW-UP (SURVEY OF PRODUCERS)

EXTENSION AGENTS SURVEYING FOR BASE DATA FROM EACH PRODUCER ATTENDING MEETING.

(ANALYSIS OF DATA COLLECTING)

1. IDENTIFY AREAS OF OPPORTUNITY AND IMPACT KEY PRODUCTION INDICATORS.
2. IDENTIFY POSSIBLE AREAS OF RESEARCH.
3. IDENTIFY PRODUCERS THAT HAVE SIMILAR DATA WILLING TO COOPERATE IN FURTHER DEMONSTRATIONS.

SYSTEMS FOR CATTLEMEN; MAKING THEM WORK

The Seedstock Producer

by
Steve Radakovich
Earlham, Iowa

Systems evaluations is a new and exciting way in which to approach beef cattle production and evaluation. Most past BIF conventions have addressed modifications of traditional beef performance methods. Systems on the other hand is a totally new and revolutionary approach to beef cattle evaluation. Just a concept that bigger isn't necessarily better is saying something new for most beef producers or the approach that more milk may be detrimental in a particular environment is also a dramatic departure from traditional thought.

If we examine the history of agriculture in the United States and particularly the history of animal breeding, the one trueism that has always prevailed has been that more has always been considered better: more corn production per acre, more eggs per hen, more milk per cow, more weaning weight per calf. The underlying factor that caused this to be true however, was that we had relatively low cost inputs. Today that is no longer the case. A relevant parellel is with the American automobile. When I was in high school, the only consideration relative to a car was how fast it would go. Today we are concerned with how far that automobile will go on a gallon of gas. Today efficiency is the watchword throughout our society. The same concept applies in agriculture. Instead of being concerned totally with outputs now we are more concerned about additional output per additional unit of input. This applies not only to fertilizer but also to some limited natural resources such as water.

We have been using a systems approach in our operation since we first started taking birth weights and have been using birth weights as a moderating influence on unlimited increases in yearling weights. We have tried to balance these traits. This is a very simple approach to beef cattle systems. Many have the concern that with systems, you turn your total breeding program over to a computer which employs some sophisticated and little understood formulae for beef cattle selection. This is not necessarily true. The systems approach is a common sense business approach to any enterprise. It involves inputs and outputs. It involves very important weights and inventory. Most commercial producers within our industry, and especially cow-calf operators, are very quick to accept this systems policy. They may not understand the scientific theory behind it, but they do understand that their primary concern is with maximizing their net income. They understand that this is influenced by day of calving, by the size of the calf, and the number of calves that are weaned. They are also very aware of the cost input, such as vet bills, feed bills, extra labor, improvements required for inside calving and others that may go into any cow-calf operation.

Let's look at an example of one factor driving the system. If the ideal carcass weight in terms of price per pound is 700-800 pounds, then carcasses which weigh more than 800 or less than 700 pounds will receive a correspondingly lower price. If our own environment is such that the ideal end product for our system is 600 pounds, then we realize that we must experience or be willing to accept a reduced price per pound for our product. One of the options is to try and force our product into the heavier weight classifications of the ideal. However, we know from Butterfield's work and other research in the United States that this will result in a less desirable product from the cutability point of view. Research tells us that in order to maximize feed efficiency, we must slaughter cattle at their ideal physiological endpoint. This allows us to make some selections for the desired slaughtered endpoints through frame size. However, not all environments will allow us to produce cattle with extreme frame sizes. Consequently, there is a trade-off between reproductive efficiency and price received for the final product.

It is with the systems approach that we finally come to grips in an important way with genetic antagonisms. Anyone that has extensive experience with beef cattle breeding knows that there are trade-offs between birth weights and growth, between excessive milk production and reproduction and between excessive frame and thriftiness. While the commercial producers have been the most receptive to the systems approach, the full responsibility for breeding cattle which have a high degree efficiency as evaluated under this concept still lies with the seedstock breeder.

Success with the systems approach involves an attempt to balance traits. Perhaps an analogy would be appropriate at this time. If you can relate to corn production in Iowa, essentially four inputs are required. One is fertilizer, second is plant population or seed density, third is rainfall and fourth are insecticides and herbicides. These factors must be present in an appropriate balance in order to achieve successful corn crop production. This is the same as balancing beef cattle production traits. How much growth can be developed and still keep birth weights and calving ease in line? Ultimately, the environment is going to have a tremendous impact in determining the desirable endpoint with regard to mature size and carcass weight. The key is to balance the environmental inputs and the genetic potential of a commercial herd.

Another major way in which the systems approach differs from the traditional production testing system is that a systems approach is based upon the total pounds of production from a given input of resources as opposed to the pounds of production per cow unit. In other words, in the systems approach, we are concerned with the number of cows in addition to the size of the cows which are run within the boundaries of a fence. A greater number of small cows can be run on the same amount of feed as a smaller number of large cows. The question then is which is the most profitable situation? A successful systems program will provide the answer.

Let me share with you briefly how we attempt to follow the systems concept in our own production situation. Our registered herds consist of Hereford and Angus cattle. We think the ideal frame size in terms of efficiency of production for our customers is between 4.5 - 5.5. While this may help our commercial producers maximize profit, it does not necessarily relate directly to our own profitability, since seedstock prices are tied so closely today to frame size. Another rule that we follow is that we attempt to keep our environment very similar to the environment of our customers. If my yearling heifers aren't cycling, I am not going to go out and feed them a higher level of supplement simply because our commercial customers cannot afford to do so and still show a profit. I believe that cattle have to work for my customers in order for me to have any longevity in the seedstock business. As far as bull selection is concerned, it is our policy to breed artificially to proven sires. As I go through the Field Data Sire Report, I look for bulls that meet acceptable levels in three important production traits. First a bull must not be over +3 pounds EPD on birth weight, he has to be +35 pounds on yearling weight, and he cannot be under 105 on maternal breeding value. Five bulls out of 670 listed in the current Angus Sire Evaluation Report met all of these criteria. Once we have identified these individuals, then we do some reproductive studies and check out their soundness and longevity and other traits that still require visual appraisal. These are our basic criteria. As you can see, we are not selecting for the extremes. Instead, we are looking for an animal that is balanced and economically sound in the production traits. Obviously, bulls that meet all of our selection criteria are the exceptions. This is one of the real challenges of the animal breeder today and tomorrow. He must look for exceptions that are beneficial to the industry and then propogate them in order to be classified as a true animal breeder.

One of the key factors which tells us how good a job we have done in balancing our cattle in our environment is our reproductive rate. One of the things that we have just started to look at is day of calving. We compare cattle of various levels of production for a variety of traits with their position in our calving season. For example, if our two-year-olds or our three-year-olds are not cycling back after calving soon enough and are consequently in the middle or latter third of our season, then perhaps we are getting more size and more production potential breed into our cattle than our environment can stand. Or, if we segregate our cattle according to maternal breeding value and find that the cattle in the last third of the calving season have the highest maternal breeding values then perhaps our milk production level has exceeded our environmental capabilities. The same thing could also relate to frame size of cattle. This is a simple method of evaluating the compatibility of the environment and the level of herd genetics.

Another concern of ours as seedstock producers that relates to the systems approach is the concept of functional efficiency. We are very interested in cattle that require a low level of management or labor input. For example, we certainly desire cows that calve by themselves and don't require attention to their udder at calving time. That is one good thing about the short post calving intervals in the beef cattle business. When the beginning of the breeding season rolls around, it is still fresh in our minds that we have had to wade through the mud, pull calves and milk cows so that we can still remember those cows which had been problems to us during the calving season. Functional efficiency is of greatest concern to the owner-operator. He is the one who has to calve the cows and live with them on a day-to-day basis. The way we select for functional efficiency is we basically select against those cattle that are inefficient. In other words, we keep 90% of our females. If they don't breed this fall or if they don't calve easily, then they are sold. If they can't walk and whenever they get bad feet, they are sold. The only way to avoid having these problems creep into a cow herd is to cull against them.

I would also like to comment on generation turnover in our herd. At one time, we were excited about roll generations to achieve rapid genetic progress. Once too, we were very excited about frame and we felt the way to increase frame rapidly was to roll generations and we bred big to big so we could make them even bigger. However, as we have backed off frame size and have gone to a multiple trait selection concept, I am also not as concerned about generation turnover. Instead, we have a tendancy to use proven bulls in our program, since the only way to evaluate cattle for all the important traits such as ease of calving, milk production, and so forth, is to have an adequate progeny test on the bulls under consideration. In the example I used earlier, I indicated that five of the 670 bulls listed in the Angus Sire Evaluation Report meet acceptable levels of production for all the traits. The odds that a young unproven bull would be superior to one of these five is very remote. Now we select primarily on breeding value ratios and disregard age. For example, if we are trying to improve milk production, we go through all of our cattle and identify the individuals with the lowest maternal breeding value ratios and eliminate them from our herd regardless of what their age is.

One of the frustrations of the systems breeder is that in most cases, he is going to select for mediocrity. In other words, he is not going to identify individuals which are superior in any one of the traits, but one which has an acceptable level in all of them. One of the realities of this type of selection is that if you are a true systems breeder and you are balancing your traits for maximum net profit, then your chances for winning in a showring or a central test station will be very slim. Unfortunately, many of our traditional performance testing programs tend to glorify the terminal cross concept individuals. If one is to accept the systems approach and be primarily concerned about the net profit your customer is going to make off of your genetics, then you must face the reality that you are breeding for moderation in most traits. If one doesn't realize this before entering into this systems concept, then beef cattle breeding will become very frustrating.

I think that our seedstock industry is changing dramatically. It has been very exciting and enjoyable living in the simplistic era that we have just been through, where it was easy to identify those individuals that could provide a little extra growth in our programs. Single trait selection is much simpler and much more satisfying in the short term when compared to systems selection. If one were to select only for growth today and use all the breeding value information that is presently available, this would be a relatively simple task. Presently we don't have breeding values that identify cattle which are superior in the multiple trait concept. Consequently, the job for the individual breeder is much more difficult in terms of identifying the animal that has the greatest potential for net profit. This will require a greater level of understanding, not only of performance records, but also of how genetics relate to a given environment. Obviously, the first question each of us must ask is what are the traits that relate to net profit. Obviously, these are many and there will be some antagonisms.

In the midwest, where I come from, cattle are a low priority agricultural enterprise. I view them basically as the utilizer of areas that would otherwise be wasted. In other words, they would be used to clean up hedge rows, water ways, and pasture grounds that cannot be put into cultivation. In order to be profitable, they are going to be required to have a low intensity management, low labor and low cash inputs. In other words, they must be able to do it on their own. The typical Iowa farmer is highly skilled in grain production and hog production where there is a larger potential for net profit on a moderate scale operation. Cattle, on the other hand, must function as ruminants to utilize the waste feed or the by-product feeds from these other operations. In order for cattle to work in this type of a situation, they must be low maintenance and self-preserving. They must be able to reproduce with a minimal amount of difficulty at two-years of age. Those of us that are having trouble with distocia and calving ease had better take a look at the birth weights of our cattle and their genetic merit. I would encourage the breed associations to do their best to emphasize the need for functionally efficient cattle. It is difficult to find a way to glamourize or promote reproduction or maternal traits or functional efficiency instead of to simply identify frame size. Unfortunately, frame size is glorified in the show ring, in the test stations, and, in some cases, in the reference sire program. I think the challenge for the breed associations is to come up with a reproductive breeding value and one also for mature size, since mature size is so closely related to functional efficiency and maintenance cost.

I don't think there is any free lunch in the cattle business and it doesn't matter if we are talking about crossbreeding or selection within our traditional breeds. The extra level of production, whether it be from heterosis or selection, has to come from additional input in the form of feed resources and management. One of the real challenges for tomorrow will be how well we can effectively merchandize those cattle which are systems efficient. As a producer in the private sector, if I can breed to a systems bull, but if that bull's calves are unpopular then I am going to have trouble merchandizing them and my net income will reflect this. However, I believe that each of us has a moral obligation to selection and identify cattle which can make the greatest genetic contribution to the profitability of our total industry.

FUTURE AND DIRECTION OF THE U.S. BEEF INDUSTRY

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Beef in the Diet

As is true of other muscle meats, beef is valued in the human diet primarily for its protein content. Table 1 shows that beef accounts for 17% of the protein consumed in the average American diet, which amounts to 17 g of protein per person daily. (Marston and Welsh, 1981). The recommended daily allowance of protein for U.S. adult males is 56 g (NRC, 1980). The average daily protein consumption of 103 g per capita is nearly twice the requirement. If beef were eliminated from the U.S. diet, we would still consume an average of 50% more protein than is needed. Therefore, one might conclude that beef is not absolutely necessary to satisfy the protein requirement of the average U.S. citizen.

In addition to its protein content, beef is a relatively rich source of vitamin B_{12}, niacin, riboflavin, zinc and iron (Hegarty, 1979). Nevertheless, there are other rich sources of these nutrients, which again suggests that beef is not an altogether indispensable item in the American diet. Most would agree that beef is eaten not because of its nutritive value but because Americans have acquired a preference for it. This raises a pertinent question: How much beef will Americans consume at a price that will permit it to be produced at a reasonable profit? In other words, What is the future for our product?

Future Demand for Beef

In laying plans for the future of the industry, it does seem important to consider the demand for the eventual product, beef.

TABLE 1. SOURCES OF PROTEIN IN AVERAGE AMERICAN DIET, 1980[a]

Food source	Daily protein per capita, g
Beef and veal	17.4
Pork	12.6
Lamb and mutton	.3
Poultry meat	11.4
Fish	2.4
Eggs	5.0
Dairy products	20.8
Grain products	19.4
Other	13.6
Total	103.0

[a] Marston and Welsh (1981).

Table 2 compares per capita consumption of the major protein foods in the United States for the years 1960 and 1981 (USDA, 1982a). During this 21-year period, beef and veal supplies peaked in 1976 at a level of 99 lb and declined to the present level of 79 lb per capita. At the 1976 level, beef production was highly unprofitable. It was assumed by most industry analysts that a decline in beef supplies to the 1981 level of 79 lb would result in prices that would permit a reasonable profit for producers. This has not happened. Cow-calf producers made some recovery in 1978 and 1979 but have faced declining prices since then. Cattle feeders have experienced negative returns for 3 years out of 5, (USDA, 1982b). There appear to be two basic reasons for this scenario: (1) a sharp increase in the cost of cattle production, and (2) a lower-than-expected consumer demand for beef, presumably resulting from a decline in real income and a greater share of that income going for energy, transportation, leaving less for discretionary spending.

Among other major protein foods, the past 21 years has seen a steady increase in consumption of poultry, fish and cheese. In general, grain consumption has not changed, while fluid milk, eggs and lamb have declined. Pork production stabilized at 55 to 60 lb for many years until it increased sharply during 1979 and 1980, resulting in significant economic losses to swine producers.

The price index figures in table 3 illustrate some of the competitive situations that affect beef (USDA, 1982a). Relative to 1967, wholesale and

TABLE 2. PER CAPITA CONSUMPTION OF MAJOR PROTEIN FOODS (RETAIL WT.)[a]

Food source	Year 1960	Year 1981	% change 1960 to 1981
	lb per capita		
Beef & veal	69.5	79.5	+14%
Pork	60.3	65.0	+ 8%
Lamb & mutton	4.3	1.5	-65%
Poultry meat	34.0	62.0	+82%
Fish	10.3	13.5	+31%
Eggs	42.4	35.0	-17%
Cheese	8.3	18.0	+117%
Fluid milk & cream	321	278	-13%
Grains	124.1	129.2	+4%

[a] USDA (1982a).

TABLE 3. 1980 PRICE INDEXES (1967 = 100)[a]

Food source	Wholesale price index	Retail price index
Beef & veal	260	270
Pork	197	209
Poultry meat	193	191
Fish	371	330
Eggs	171	170
Dairy products	231	227

[a] USDA (1982a).

retail beef prices have risen more than the price of all other animal products except for fish, which has increased the most. Beef and pork are the only two commodities whose retail price indexes are higher than their wholesale indexes. This is largely because the relative cost of processing and handling beef and pork is greater than for other products; consequently, their retail price index has risen more than their wholesale index.

If the spread in per-pound cost between beef and other protein sources continues to widen as it has in recent years, beef's competitive position will become eroded even further. As it is now, cattlemen have been losing money even with relatively large retail price increases. Without improvements in the efficiency of all aspects of production, marketing and promotion of beef, it appears that per capita beef supplies may have to decline further in order to command a price high enough to cover all costs. Table 4 represents an attempt to account for all costs of producing beef in the United States during 1981. These figures are estimates based upon data from government and industry sources.

Total cost of producing a typical 1100 lb. Choice steer from conception to consumer was about $1070 in 1981. Gross returns from the sale of the edible portion as well as by-products totaled about $1025, resulting in a net loss to the industry of approximately $45. In 1981, this loss was largely absorbed by the cattle feeding segment of the industry.

TABLE 4. ESTIMATED COST OF PRODUCING BEEF IN U.S., 1981

Item	$
Producing 450 lb feeder calf	385
Finishing to 1100 lb slaughter wt.	430
Killing, processing & shipping 430 lb boxed beef	75
Wholesale & retail costs	180
Total costs	1070

Improving Efficiency

Table 5 lists those major constraints which, in my opinion, are a road-block to more efficient and profitable beef production. First of all, our current systems take too long to produce the final product, which results in extremely high interest charges. A second problem is that nearly 70% of the dietary energy expended in producing beef goes to maintenance and only 30% goes to production. Third, the live animal and the beef it produces is transported too many miles before it is consumed, resulting in high trucking costs as well as losses in the form of shrink, morbidity and mortality. Fourth, the feeder is encouraged to overfatten cattle to ensure Choice grade so as to maximize selling price, in spite of the fact that research has shown the relationship between marbling and palatability is low. Recent work at Purdue University (Aberle *et al.*, 1981) suggests that a rapid rate of growth prior to slaughter may be a more important determinant of tenderness than the length of time that cattle are fed a high energy diet.

Table 6 illustrates the relatively inefficient use of dietary energy in a beef cow herd up to weaning time. The four studies cited indicate that 75 to 80% of the TDN consumed is used for maintenance and only 20 to 25% for productive purposes. In an integrated enterprise, in which the calf is fed from weaning to slaughter without backgrounding, the average amount of TDN used for production is increased to about 32%. It is only fair to point out, however, that much of the TDN used for the maintenance of a beef cow is provided in the form of fibrous feeds that would otherwise go unutilized.

Up to this point, the relative inefficiencies and lack of profitability in the industry have been considered. The logical question that follows is: What can be done to change it? Presumably, significant cutbacks

TABLE 5. CONSTRAINTS ON BEEF PRODUCTION EFFICIENCY

Constraint
(1) Long production cycle coupled with high interest rates.
(2) Nearly 70% of dietary energy is for maintenance.
(3) Transportation and associated costs:
(a) Trucking
(b) Shrink
(c) Morbidity
(d) Mortality
(4) High degree of fatness to ensure Choice grade.

TABLE 6. TOTAL DIGESTIBLE NUTRIENT (TDN) USAGE IN COW-CALF HERDS[a]

Reference	Usage	
	Maintenance	Production
	% of total	
Klosterman & Parker (1976)	74.6	25.4
Wyatt et al. (1977)	74.0	26.0
Martin & McReynolds (1979)	75.9	24.1
Brown & Dinkel (1978)	80.8	19.2

[a] Based on data from references cited.

in the national cow herd would eventually reduce supplies of beef and force prices up to profitable levels. However, this action can no longer be considered a permanent cure for the ills that plague the industry, because cost of production may have gone beyond what the consumer is willing to pay for beef. Instead, I believe the industry must reorganize its thinking and make some far-reaching changes so as to improve the efficiency of producing the product. Table 7 lists those areas that appear to deserve attention.

Of the total TDN expended in producing beef, 55% goes just to maintain the breeding cow herd. In order to dilute this cost, cow-calf producers must be in a position in the years ahead to sell more pounds of calf per cow exposed. One possible means of accomplishing this would be to retain ownership of the

TABLE 7. IMPROVING EFFICIENCY OF BEEF PRODUCTION

Possible steps
(1) Dilute maintenance costs: sell more weight per cow.
(2) If possible, retain ownership of calves to slaughter.
(3) Reduce time on feed to minimum needed for acceptable palatability.
(4) Reduce emphasis on marbling; stress lean growth.
(5) Fine-tune the trade-off between lean growth and:
(a) More energy to maintain fertility.
(b) Dystocia.
(6) Adopt new technology in processing and merchandising beef.

calves until slaughter. In many operations, however, this may not be possible from a cash-flow standpoint. In an integrated system, calves should be high performers in order to minimize time on feed and interest charges. Retaining ownership and feeding them on the home place, or nearby, would help eliminate some of the present transportation costs, shrinkage, disease and death loss.

At the risk of lowering meat quality, I feel it is imperative that we reduce the present emphasis on marbling, place greater emphasis on lean growth and transform ourselves into a generation of protein producers instead of fat producers. This metamorphosis may be a painful one for our tradition-bound beef industry, but I believe it will come to pass. This change would permit us to feed calves with high genetic potential for lean growth to acceptable carcass weights without their becoming excessively fat. Recent research at Iowa State University (Burroughs and Trenkle, 1980) has demonstrated that it is possible to feed a diet of 60% corn cobs to Charolais-Angus-cross steers for 8 months with an average gain of over 2 lb per day and an average yield grade of 2.1. If marbling requirements were lowered, whether the cattle were fed high or low energy feedstuffs would depend primarily on the relative cost of the feeds in question as well as on the costs that increase with days on feed, such as interest and labor.

If the industry moves in the direction of producing calves with a higher propensity for lean growth, potential problems do exist; primarily more energy to maintain fertility and a higher incidence of dystocia. I am cautiously optimistic that we can somehow select, mate and manage our way around these important problems. Adoption of new technology in the processing and merchandising of the carcass could perhaps do more to lower the retail cost of beef than anything we could do in the production of the live animal.

Search for the Ideal Cow

In our quest to improve production efficiency in the cow-calf segment of the industry, we are logically led on a search for the ideal cow and the ideal bull with which to mate her. Regarding mating systems, there are fewer reasons all the time for not crossbreeding. At one time, it was recommended that smaller, part-time producers with limited resources should probably stay with straight breeding because crossing systems may be too complex for them to carry out. Turning away from the 10 to 25% improvement in efficiency that can be harvested from heterosis is too high a price to pay for remaining simple and uncomplicated. The advantages of the crossbred female have been well researched and documented, but in a recent survey of cow-calf producers in the northeastern quarter of the United States, only 21% of the respondents reported having crossbred herds, (Schwab and Garst, 1976). Gosey (1979), and Gregory and Cundiff (1980) as well as other workers have described effective crossbreeding programs for producers with limited time and resources that still maintain a high percentage of maximum possible heterosis. These programs should be brought to the attention of smaller herd owners.

The next question concerning the ideal cow is: What size and how much milk? Prior to 1967, only limited data were available on the relationships between cow size, milking ability and efficiency. Since then, a number of important studies have shed light on this subject. Table 8 is a summary of how these studies have expressed biological efficiency. They range all the way from calf weight per cow at weaning time to cow and calf energy consumption per unit of edible portion. It should be stressed that these are measures of biological efficiency. In recent years, a number of comprehensive computer simulation studies have evaluated economic efficiency. These simulation

TABLE 8. EXPRESSING BEEF COW BIOLOGICAL EFFICIENCY

Expression of Efficiency
(1) Weaning weight/cow at weaning.
(2) Weaning weight/cow calving.
(3) Weaning weight/cow wintered.
(4) Weaning weight/cow exposed.
(5) Cow + calf TDN/weaning weight.
(6) Cow + calf TDN/yearling or slaughter weight.
(7) Cow + calf TDN/edible portion weight.

models have attempted to account for all inputs and outputs, including feed for replacements and cull cow salvage value.

The largest body of genetic data has been generated from the Germ Plasm Evaluation Program at the U.S. Meat Animal Research Center (MARC). Table 9 summarizes weaning weight and retail product weight from F_1 steer progeny out of Hereford and Angus dams during Cycles I, II and III of the program, Except for Jersey sired calves, there was not much difference between sire breeds in weaning weight per cow calving. However, in terms of pounds of retail product produced per cow calving, the large, lean Continental breeds excelled the others. Table 10 shows the estimated profit per cow in Cycle I when steer progeny were fed to the same carcass grade (Smith, 1976). Cows mated to Limousin, Simmental and Charolais sires made the most profit in these comparisons.

Table 11 summarizes data on F_1 crossbred cows in Cycle I at U.S. MARC. Weaning weight produced per cow exposed was very similar, with a slight advantage for the Simmental cross cows. Using body weights and milk production data reported for these cows (Laster *et al.*, 1979), I estimated annual TDN consumption, based on NRC (1976) allowances. Differences in estimated TDN consumption per pound of weaning weight per cow exposed are small, although there is a slight tendency for the Angus-Hereford cross cows to be more efficient.

Table 12 presents a comparable set of data for F_1 cross cows in Cycle II at

TABLE 9. PRODUCTIVITY OF F_1 MATINGS, U.S. MARC[a]

Breed of steer (Hereford & Angus dams)	Weight/cow calving	
	Weaning	Retail product
	Trait ratio	
HA & AH	100	100
Jersey-X	90	87
South Devon-X	95	100
Limousin-X	96	105
Simmental-X	96	104
Charolais-X	95	104
Red Poll-X	100	98
Brown Swiss-X	105	111
Gelbvieh-X	101	107
Maine-Anjou-X	98	109
Chianina-X	99	112
Brahman-X	102	105
Sahiwal-X	97	97
Pinzgauer-X	100	101
Tarentaise-X	100	103

[a] Cundiff et al. (1980).

TABLE 10. PROFITABILITY OF F_1 MATINGS, U.S. MARC[a]

Breed of calf (Hereford & Angus dams)	Profit/cow when progeny fed to constant carcass grade endpoint, $
HH & AA	50
HA & AH	59
Jersey-X	36
South Devon-X	63
Limousin-X	89
Simmental-X	86
Charolais-X	90

[a] Smith (1976).

TABLE 11. SUMMARY OF 7 CALF CROPS, CYCLE I-U.S. MARC[a]

Breed of cow	Est. annual TDN, lb	Wean. wt. per cow exposed, lb	TDN per wean. wt., lb
Angus x Hereford	4203	380	11.1
Jersey-X	4382	389	11.3
South Devon-X	4410	383	11.5
Limousin-X	4233	369	11.5
Simmental-X	4735	399	11.9
Charolais-X	4458	373	11.9

[a] Based on data from NRC (1976), Laster *et al.* (1979), and Cundiff *et al.* (1981).

TABLE 12. SUMMARY OF 6 CALF CROPS, CYCLE II, U.S. MARC[a]

Breed of cow	Est. annual TDN, lb	Wean wt. per cow exposed, lb	TDN per wean. wt., lb
Angus x Hereford	4147	370	11.2
Red Poll-X	4343	363	12.0
Brown Swiss-X	4679	441	10.6
Gelbvieh-X	4679	448	10.4
Maine Anjou-X	4637	424	10.9
Chianina-X	4668	424	11.0

[a] Based on data from NRC,(1976), Laster et al., (1979), and Cundiff et al..(1981).

U.S. MARC (Cundiff et al., 1981). In this study, Gelbvieh and Brown Swiss cross cows were more efficient than the other crossbred groups with respect to either calf weight per cow exposed or estimated TDN required per pound of weaning weight.

Table 13 is taken from an extensive Canadian project involving 1150 cows at two locations for eight calf crops (Rahnefeld et al., 1980). Weight of calf/ weaned per cow exposed is used here as the measure of efficiency. Five groups of cows stand out in this study: Simmental-Shorthorn, Simmental-Angus, Charolais-Shorthorn, Simmental-Hereford and Charolais-Angus.

Table 14 is a progress report from a study involving 4,329 matings over 6 years at five locations in Virginia (Marlowe and Oliver, 1979). In terms of weaning weight per cow exposed, the Holstein crosses were clearly superior to all other crosses and straightbreds.

Magee (1979, 1981) reported similar results in a selection study in which Holstein blood was used in one of four breeding groups. Table 15 shows that the breeding group with Holstein blood weaned more calf weight and more retail cut weight per cow exposed than another rotational cross group and two straightbred Hereford groups.

Table 16 is a summary of data taken from a project at the Oklahoma Station (Wyatt et al., 1977; Totusek, 1981). In this study, Herefords, Holsteins and

TABLE 13. CALF WEIGHT WEANED PER COW EXPOSED[a]

Breed of cow	Trait ratio (Hereford x Angus = 100)
Simmental x Shorthorn	111
Simmental x Angus	111
Charolais x Shorthorn	110
Simmental x Hereford	108
Charolais x Angus	108
Charolais x Hereford	102
Limousin x Shorthorn	101
Limousin x Angus	101
Hereford x Angus	100
Limousin x Hereford	92

[a] Rahnefeld et al. (1980).

TABLE 14. SUMMARY OF 4,329 BEEF COW MATINGS (1972-78)[a]

of cow	Calves weaned/ 100 cows exposed	Wean wt./ cow exposed, lb
Straightbreds	73.5	295
All crosses	79.0	377
Holstein crosses	83.9	410

[a] Marlowe and Oliver (1979).

TABLE 15. STRAIGHT BREEDING VS. ROTATIONAL CROSSING[a]

Breeding group	11th calf crop (1978) Calf wt. weaned per cow exposed	Retail cuts/cow exposed
	Trait ratio	
Unselected Hereford	100	100
Selected Hereford	115	117
Sim X Char X Ang X Her	135	139
Sim X Hol X Ang X Her	173	151

[a] Magee (1979, 1981).

TABLE 16. EFFICIENCY OF HOLSTEIN AND HOLSTEIN-X COWS[a]

Breed of cow	Energy level	Cow & calf TDN, lb	Wean. wt. per cow exposed, lb	TDN per wean wt., lb
Hereford	Mod	4370	503	8.7
Hereford	Hi	4597	494	9.3
Her x Hol	Mod	4721	494	9.6
Her x Hol	Hi	4858	538	9.0
Holstein	Mod	5149	478	10.8
Holstein	Hi	5539	545	10.2
Holstein	Very Hi	5629	624	9.0

[a] Based on data from Wyatt et al. (1977) and Totusek (1981).

the crosses thereof were compared at various levels of dietary energy. The important observation that came out of this work was that efficiency, when expressed as TDN consumed per unit of weaning weight, was similar if each group was fed according to its potential level of production. For straight Herefords, the proper TDN level was moderate, for Hereford-Holstein crosses, it was high, and for straight Holsteins the correct level of energy was very high.

Table 17 summarizes the results of a study by Bowden (1980) in which he measured megacolories (Mcal) of digestible energy intake by both the cow and calf in four crossbred groups. There were no significant differences in Mcal required per kilo of calf weaning weight.

In an integrated beef enterprise in which the progeny are fed out for slaughter, an important measure of efficiency would be the amount of feed energy consumed per weight of edible portion produced. The classic work of Klosterman and Parker (1976) is summarized in table 18. They found no significant differences in TDN per unit of edible portion between the four breeding groups compared.

Table 19 summarizes comparable research from South Dakota (Brown and Dinkel, 1978), where the results were similar to the Ohio work in that there were no differences in TDN consumed per unit of edible portion between Angus, Charolais and their reciprocal crosses. Table 20 shows a third study of this kind, reported by Martin and McReynolds (1979), in which three groups of F_1 cross cows were compared: Hereford-Angus, Jersey-Angus and Simmental-Angus. In terms of TDN consumed per unit of edible portion, the differences between breeding groups were small, although there was a tendency for the Hereford-Angus cows to be slightly less efficient than the other two groups.

Since 1975, a number of research teams have used computer simulation models to predict the economic efficiency of various breeding, management

TABLE 17. CONVERSION OF DIGESTIBLE ENERGY[a]

Breed of dam	Mcal DE/kg calf wean. wt. Dam	Mcal DE/kg calf wean. wt. Dam + calf
	Mcal	
Simmental X Angus	20.7	23.9
Charolais X Angus	20.8	24.8
Hereford X Angus	20.2	24.1
Jersey X Angus	20.5	23.6

[a] Bowden (1980).

TABLE 18. EFFICIENCY, BIRTH TO SLAUGHTER[a]

Breed of cow	TDN/ wean. wt.	TDN/ feedlot gain	TDN/ slaughter wt.	TDN/ edible portion
		lb		
Hereford	10.1	5.1	7.1	17.4
Ang X Her	8.6	5.4	6.9	17.0
Char X Her	10.0	5.1	7.1	17.3
Charolais	9.2	5.3	7.0	17.1

[a] Klosterman and Parker (1976).

TABLE 19. EFFICIENCY, BIRTH TO SLAUGHTER[a]

Breed of cow	TDN/ wean. wt.	TDN/ feedlot gain	TDN/ slaughter wt.	TDN/ edible portion
		lb		
Angus	10.8	5.9	8.3	15.7
Ang X Char	11.0	6.0	8.6	15.6
Char X Ang	10.9	6.2	8.6	15.7
Charolais	11.0	5.9	8.5	15.4

[a] Brown and Dinkel (1978).

TABLE 20. EFFICIENCY, BIRTH TO SLAUGHTER[a]

Breed of cow	TDN/ wean. wt.	TDN/ feedlot gain	TDN/ slaughter wt.	TDN/ edible portion
		lb		
Ang X Her	9.8	5.0	7.4	16.3
Jer X Ang	8.3	5.1	6.9	15.4
Sim X Ang	8.8	5.3	7.4	15.8

[a] Based on data from Martin and McReynolds (1979).

and marketing systems in beef herds (Long et al., 1975; Morris and Wilton, 1975; Cartwright, 1979; Notter et al., 1979a,b,c; Smith, 1979; Buckley, 1980; Farris et al., 1981). In the most recent study (Farris et al., 1981), Texas researchers compared the profitability of nine biological types of cows whose calves could either be marketed as weaned feeders or fed for slaughter (table 21). They used the period from 1972 to 1979 to establish input and output prices and considered three cow sizes and three levels of milk. If the calves were sold as weaners, the heaviest milking cows within a size category had the lowest production cost per cwt of calf, but if the calves were fed out to slaughter, the lightest milkers tended to have the lowest costs. Under either marketing strategy, large cows generally exhibited the lowest cost of production. Table 22 shows net return per cow in a South Dakota simulation study (Buckley, 1980) which closely resembled the Texas work. Under either marketing strategy, the larger heavier-milking cows tended to rank higher in net return. Although they are not shown here, the absolute differences in net income were relatively small.

Notter et al. (1979 a, b, c) used a computer simulation model to evaluate the economic efficiency of various crossbreeding systems for a Midwestern cow-calf feedlot enterprise. They observed that those systems

TABLE 21. RANK OF COW BREEDTYPE UNDER TWO MARKET STRATEGIES (1972-1979 PERIOD)[a]

Cow size and milk production	Marketing Strategy: Sell weaner calf	Feed out calf
	Rank, lowest to highest production cost, $/cwt of calf	
Large-heavy	1	4
Large-moderate	3	2
Large-light	2	1
Medium-heavy	4	6
Medium-moderate	5	3
Medium-light	8	5
Small-heavy	6	9
Small-moderate	7	8
Small-light	9	7

[a] Farris *et al*. (1981).

TABLE 22. RANK OF NINE BIOLOGICAL TYPES OF COWS[a]

Cow size and milk production	Marketing strategy: Sell weaner calf	Feed out calf
	Rank, net return/cow, $	
Large-heavy	1	1
Large-medium	2	2
Large-light	4	3
Medium-heavy	3	4
Medium-medium	5	5
Medium-light	6	6
Small-heavy	7	8
Small-medium	8	7
Small-light	9	9

[a] Buckley (1980).

which used large terminal sire breeds and attempted to minimize calving difficulty were generally more profitable, but optimal sire breed size was a function of the price ratio between feedlot and cow herd TDN.

Cartwright (1979) at Texas A & M summarized much of the cow efficiency research to date when he made the following statement: "Optimal values for both size and milk production may vary as production conditions and costs and relative prices of cattle change. There does appear to be sufficient potential for increasing efficiency through matching size and milk production to a given set of conditions to warrant further research in this area; that is, there appears to be an opportunity, largely untapped, for increasing efficiency of beef production by more closely matching cattle to the production conditions." Table 23 presents examples of this match-up; that is, less size and less milk as feed becomes more limiting. The breeds used are examples of combinations of the more common breeds available, but others could be substituted in their place.

Accelerated Systems of Beef Production

In the Midwest, where we are generally blessed with moderate to abundant forage resources, it appears that we can justify systems in which roughly one-half to two-thirds of the genes in the end-product are contributed by larger, heavier-milking breeds. An excellent example of what can be achieved is presented in table 24 (Miller et al., 1980). This table is a summary of

TABLE 23. EXAMPLES OF MATCHING SIZE AND MILK TO FEED RESOURCES

Feed resources	Example
Abundant:	Holstein-Simmental cow x Charolais bull.
Moderate:	Angus-Simmental cow x Gelbvieh bull.
Limited:	Shorthorn-Hereford cow x Limousin bull.
Sparse:	Brahman-Angus cow x Hereford bull.

TABLE 24. EXAMPLE OF ACCELERATED BEEF PRODUCTION[a]

Summary of fourth calf crop (1979)	
Mating system: Charolais sire x Simmental-Angus cows	
Weaning wt at 205 days (steer basis), lb	646
Weaning wt/cow exposed, lb	576
Steer slaughter wt at 15 mo, lb	1284
Carcass wt, lb	815
Fat thickness, in.	.20
Yield grade	1.9
Retail cuts/cow exposed, lb	567

[a] Miller et al. (1980).

the fourth calf crop from a highly productive herd of Simmental-Angus cows mated by A.I. to a superior Charolais sire. Both the actual and adjusted weaning weights were identical, 646 lb. With an 89% calf crop, this herd yielded 576 lb of weaned calf weight per cow exposed. The cows averaged 1148 lb, so they produced a calf that weighed 56% of their body weight. The steer progeny were fed out and slaughtered at 15 mo of age at a weight of 1284 lb with a yield grade of 1.9. Average weight of retail cuts produced per cow exposed was a phenomenal 567 lb. This cow herd is maintained on high quality native range in the summer plus hay and protein supplement in the winter. There is no record of the TDN consumption in this herd, but it does seem reasonably safe. to assume that it represents an efficient and potentially profitable system of beef production.

Magee (1979, 1981) at Michigan State University maintains a four-way rotational cross herd of 50 cows composed of Simmental, Holstein, Angus and Hereford blood. They are being compared with three other breeding groups - an unselected Hereford group, a selected Hereford group and another rotational group. Selection is for yearling weight. Figure 1 illustrates the power of selection and crossbreeding in this project. These steers are pictured at 15 months of age, when they were slaughtered. The Hereford came from the unselected straightbred control group and the large steer is from the four-way rotational cross group. These steers are descended from the same base herd of Hereford cows that was used to initiate the project 14 years ago. They each

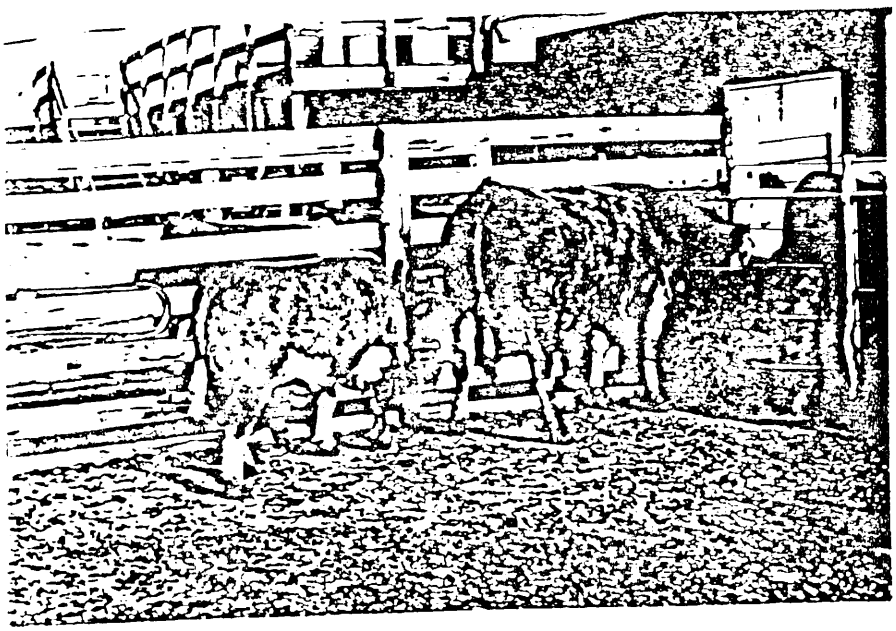

Figure 1. Example of 14 years of selection and crossbreeding (Magee, 1981). These two steers are descendents of the same straightbred Hereford cow herd which was used to initiate this project in 1967. On the day they were slaughtered, they were each 15 months old. The unselected straightbred Hereford control steer weighed 875 lb; the selected 4-breed rotational cross steer weighed 1525 lb.

received a quality grade of Choice and a yield grade of 3. The only difference was that the crossbred outweighed the control steer by 75% (1525 vs 875 lb). The large steer was carried to this age, weight, and fatness to ensure that he would grade Choice. This was perhaps a waste of resources. He could have been killed at 12 mo of age, weighing 1170 lb, yield grading 2 and quality grading Good. For that matter, he could have been left on his dam until 9 mo of age and then weaned and slaughtered at a weight of 850 lb. This may seem preposterous to those of us who have been reared in the culture of Choice corn-fed beef. However, I have spent a considerable amount of time in the Adelaide area of South Central Australia, where the bulk of the beef consumed comes from 8- to 11-mo-old weaner calves weighing 600 to 800 lb. Because of its youth, the beef is tender as well as being lean. Whether American consumers would find this younger beef as acceptable as older beef is open to question.

I feel that we must study these accelerated systems as possible beef production alternatives. In addition, I believe we should continue to investigate the feasibility of leaving male calves as intact bulls. The advantage that bulls hold over steers in lean growth has been well documented. Amidst all of this, several questions must be answered by research: (1) How young can we kill cattle and maintain consumer acceptability? (2) What is the lower fat limit on extremely young cattle? (3) Can we make young bull beef as acceptable as steer and heifer beef? For example, recent research in South Dakota (Stout *et al*., 1981) suggests that palatability of the meat may be improved by implanting young bulls with a hormonal growth stimulant.

Other Avenues for Improving Efficiency

In addition to the points above, there are a number of other means at our disposal for increasing the efficiency of beef production:

(1) Growth stimulants can be implanted to increase rate of gain;

(2) Monensin can be fed to improve feed efficiency.

(3) The reproductive rate of beef cattle could possibly be increased through twinning; this technique holds great potential for increasing efficiency but it is besieged with problems;

(4) Cattle can now be either video or computer marketed which could streamline our marketing system and reduce costs;

(5) Continued research and development of new vaccines to reduce calf morbidity and mortality from birth to weaning could decrease cost of production significantly;

(6) Economical methods for treating low-quality crop residues to increase their digestibility could be a boon to cow-calf producers, especially in the Midwestern states;

(7) Innovative procedures for slaughtering and processing of beef are being researched and developed; if adopted by the industry, they have the potential for enhancing quality, extending shelf-life, lowering production costs, and improving acceptability of certain portions of the carcass;

(8) Sire evaluation programs, which are proving to be a great asset to the seedstock producers who use them, could be expanded to include more breeders; purebred breeders who hope to be in the mainstream of genetic progress in the years ahead must be committed to a program of testing for measurable traits having high economic value. If purebred breeders fail to provide commercial herds with productive seedstock, there is some evidence to suggest that commercial companies will become more active in the production of beef seedstock, as they are now in the swine industry.

Even when a technological breakthrough that holds real economic merit for cow-calf producers comes along, it is often difficult to implement. I assume the major reason for this is the fact that 80% of the cow-calf producers have less than a 50-cow herd (Boykin et al., 1980); consequently, it does not provide a major source of the family income. This presents a real challenge to those of us in extension who work with cow-calf clientele.

Conclusion

It is difficult to speak optimistically today about the beef industry. Many producers, as well as economists, generally share the pessimism that pervades the industry. But to paraphrase Mark Antony: "I come to neither praise the industry nor to bury it." Instead, my intent has been to stimulate thought and discussion toward some different systems of production. The traditional systems are not working as well as they once did. There are possibly some better ways. It is our challenge to identify them and communicate them to the industry.

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Beef the Product

Dell M. Allen
Presented at the BIF Meetings, Rapid City,
South Dakota - April 30, 1982

In preparing for this talk, I found myself in the same position as Cassandra. Cassandra was a greek goddess who was given the ability to accurately prophesy the future. However, because she rejected the amorous advances of the God, Appollo, who had given her this ability, he ordained that while her prophesies would be accurate, no one would believe her. I don't claim to have the accuracy of Cassandra, but I also know that no one will believe everything that I say, so in that way, she and I are in the same boat.

Currently, many cattlemen feel like they have just read my bankers bumper sticker which says "Money is life's report card." If this bumper sticker is true, most cattlemen are currently flunking the course. What are the major problems currently confronting cattlemen?

First, one of the major problems, if not the major, is the economy. Consider what the cattlemen's costs of production have done in recent years. Energy costs, feed costs, interest costs and all other production costs have gone steadily upward while during much of that time, his profits have narrowed or been in deficit. Inflation has taken a definite toll on cattlemen and while the current $70 plus fat cattle market looks good to him, consider the following:

If we adjust current farm prices for inflation that has occurred since 1970 (12 years), current farm prices look like this in 1970 dollars:

	1982 Price	1970 dollar equivalent
Fat cattle	$70.00/cwt.	$27.50/cwt.
Feeder cattle	65.00/cwt.	25.50/cwt.
Soybeans	6.25/bu.	2.45/bu.
Wheat	3.60/bu.	1.00/bu.
Corn	2.50/bu.	.80/bu.

The perception persists though, that $70 fat cattle is a good price. It takes time to adjust perceptions to inflation and thus current prices look high to the cattlemen even though in buying power they have not advanced. Consumers are no different than cattlemen and thus they perceive that beef prices are high compared to just a few years ago. Also, largely due increased labor and energy costs, the consumer price index of beef has increased more rapidly than pork and poultry, thus causing consumers to more willingly shift to competitive meats.

A second very real problem of the cattle industry is the diet-health issue of how much meat is enough, coupled with the growing moral issue of a hungry planet. Consider the following comments that over the past several years have been "headlined" in a number of publications.

Dr. Mark Hegsted, Harvard nutritionist and a former director of the USDA Institute of Human Nutrition in the Carter administration said, "The national diet of the United States is the most wasteful of resources of any in the world. The nature of our food supply has become a moral issue as well as an economic issue."

Senator Edward Kennedy has stated, "to advocate the continued urging of the American consumer to eat more beef, the United States is drawing of the needed protein from hundreds of millions of people that live in third world countries. It seems to me to be perhaps even an inhumane policy for us to continue to let beef people raise cattle the way they want to."

An official release of a U.S. Government Conference on Human Nutrition, "by feeding cattle, we're taking food from the mouths of people just a surely as if we're burning the crops in the field." A comment made by a Harvard nutritionist, "present meat grades are now obsolete and need to be updated, perhaps, for public health reasons." A Columbia University nutritionist states, "the implication that meats are nutritionally essential is wrong.

The United States must help conserve these protein sources." Finally, a quote from an article in a 1981 edition of the Wichita, Kansas Eagle newspaper stated in part, "imagine yourself in a restaurant in front of an 8 oz. steak, and then imagine 40-50 people with empty bowls in front of them. For the feed cost of your steak, each of their bowls could be filled with a full cup of cooked cereal grain."

People have heard and read these type of comments now for several years. These comments are made by serious and largely well-intentioned but perhaps misinformed people. Regardless, they have been made and heard and at least in-part believed. The cattle industry at the same time has done a very poor job of counter attacking these comments.

As we think about counter-attacking, however, I think we must also face the question of whether or not there is any truth in some of these consumerist allegations.

Current Industry Practices

Considering this, I think the beef industry must confront the question of what is a desirable end-point for slaughter cattle that will optimize quality (palatability) and minimize wastiness. As we attempt to answer this, I think most people would agree that this end-point seems to be palatability equivalent to that of Choice grade beef and wastiness equivalent to a yield grade two. I feel that over the next several years, this compositional end-point (equivalent to a yield grade 2) will become very important as an end-point at which to market slaughter cattle. The composition of a yield grade 2 beef carcass is given in table 1[1]. Calculated percent fat of this carcass shows a 28.7% carcass fat when kidney fat is included and 26.4% fat when kidney fat is excluded. This compositional end-point provides for adequate carcass fatness to insure palatability and yet minimizes waste.

If we assume that the yield grade 2 level of composition is optimum, what are current beef production practices in comparison to this standard.

Table 2 shows the 1981 graded beef production for the U.S. beef industry for quality grades[2]. It is easily seen that of all beef graded, the vast majority of it (95.6%) grades Choice and Prime. Since beef grading is a voluntary act, this simply points out that beef that does not qualify for Choice or Prime is not graded. The 12.1 billion lb. of graded beef represent approximately 56% of the total beef produced in the U.S. in 1981.

Table 3 shows the breakdown of beef graded by yield grade[2]. This shows that 32.2% of beef graded was yield grade 1 or 2. If the yield grade 2 represents the optimum compositional end-point, this means we over-finished 67.8% of all beef graded in 1981. Table 4 shows the cut-out percentages for retail yield (with ground beef trim standardized at 25% fat and roast and steaks at approximately 20% fat) and waste fat trim yields for yield grades 2 thru 5[1]. Using the yield grade 2 fat content as a standard, table 5 shows the amount of excess fat that was produced in 1981 on yield grades 3, 4 and 5. According to Riley[3], the energy content of lean is 2,584 Kcal/lb. and fat is 4,258 Kcal/lb. Thus, the energy content of the excess fat produced in 1981 is equal to 2.057 trillion Kcal. (483,087, 895 lb. fat x 4258 Kcal/lb). This waste becomes more meaningful when we consider that the approximate energy content represented in a 650 lb., yield grade 2 beef carcass is 1.7 million Kcal. Thus, the energy represented in the waste fat produced in 1981 is equivalent to 1,210,000 yield grade 2 beef carcasses weighing 650 lb. This equals approximately a 2 week slaughter total for the U.S. beef industry.

This points out that there is currently considerable waste in U.S. cattle feeding practices and that this represents an obvious way in which the industry can improve production efficiency.

<u>Carcass Grade Changes</u>

Economics alone will force the beef industry to produce leaner beef over the next several years. An obvious way that could facilitate a faster realization of leaner beef production would be by making changes in the U.S. beef grading standards such that leaner beef production would be encouraged economically.

In considering grade changes, most consideration has been given to the lessening of marbling requirements, thus enabling carcasses to grade in the two upper grades (Choice and Prime) with less marbling. The logic is that if this were done, cattle would be fed less and thus be leaner and more economical to produce. It is argued that this could be done without lowering palatability significantly in the ranges of slight marbling and above. Considerable research done over the past few years indicates that time on feed and plane of nutrition contributes more to palatability level than does degree of marbling. Due to these findings, as well as the economic push for greater production efficiency, as time progresses, marbling will be de-emphasized as a grade factor from its current significance.

<u>NCA and USDA Proposals</u>

The most publicized grade change proposals have been those recommended by the National Cattlemen's Association and the final proposal by the USDA. These proposals are shown in figure 1[4]. The justification given in recommending these changes is the fact that neither would result in appreciably different palatability characteristics from the current grades. The real reason they have been promoted is the concept that it will allow the reduction of feeding time thus lessening costs and improving leanness. Before accepting these arguments at face value, the industry should ask itself if either change will appreciably alter current practices.

It is the contention of some people that neither change would do much to reduce length of feeding period. This, because of the industry practice of pricing cattle on the basis of not only quality and yield grade, but equally or more so, due to expected dressing percent. Under that pricing system, top prices are paid for those cattle that have been fed to a point that they are as fat as possible and still be a yield grade 3. Due to the price discrimination against yield grade 4's, if they reach that grade they are discounted in price. Likewise, there is currently little or no price incentive to sell at the yield grade 2 level of fatness.

Yield Grade Alteration

It would seem logical, then, that if we want to rapidly alter feeding practices such that we produce leaner beef, we should consider altering the yield grade system, instead of, or at least at the same time that we change the quality grades. Figure 2 shows the current relationship between external fat and yield grade a suggested alteration of the lines that segment the yield grades according to carcass fatness[4]. It can be seen from this figure that the top half of the current yield grade 3 has between 0.6 to .79" of outside fat. Any carcass with this much outside fat will necessitate trimming prior to being retailed. The shift in where the yield grade lines fall would quickly reduce the time cattle are fed and move the industry towards the more desired carcass compositional end-point.

Canadian Grading System

The current Canadian grading system is an excellent example of a system which has de-emphasized marbling as a quality grade factor and at the same time aligned composition to desired levels. Figure 3 shows how the Canadian system is applied[4]. Under there system, for a carcass to qualify for A, their premere quality grade, it must have slight marbling and no credit is given for marbling levels above slight. On the yield grade side, yield grade is determined by levels of external carcass fatness. A carcass must have 0.4" or less outside fat to qualify for the 1 yield grade and 0.6" or less for the 2 grade. The A1 and A2 grades are their premium priced grades and thus feeders are effectively discouraged from feeding cattle to any fatter levels and packers are encouraged to purchase them before they get over-fat even though their dressing percents are lower.

New Grade Concept

Since changing the grade standards involve a large number of economic and political interest groups, none of the preceding talked of grade changes or systems seem likely to occur. Due this, the concept of identifying a new grade that would encompass these highly desirable lean carcasses with acceptable palatability has considerable merit. Such a grade is shown in figure 4[4]. This grade could be called a specification grade, in that for a carcass to qualify for it, it must meet all criteria listed. If it fails any of the criteria, the carcass would be graded according to the current standards. Such a grade would have the following advantages:

1. It would be a new, leaner grade of beef that would be highly promotable.
2. Most lean, growthy cattle would qualify for this grade.
3. Assuming this grade proves popular at the user level, it would probably command a premium price, thus encouraging packers to purchase cattle of this grade, feeders to feed for it and retailers to use and promote it.

Carcass Weights

Currently, the most popular carcass weights for steers is from approximately 600 to 800 lb. The packing industry, especially the newer, larger volume operations are designed and built to slaughter and process animals that produce carcasses of these weight ranges. Investment in these plants dictate that they will be used for at least the next 20 to 30 years so it is probably wrong to assume they will readily or quickly alter their preferred weight ranges.

Also, as pre-portioning of retail cuts becomes more common, standardized carcass weights becomes more and more important. Thus, price discrimination against extremely heavy or light weight carcasses will likely increase rather than decrease. Table 6 shows the current common price differentials between carcasses of different weight catagories and yield grades[5].

Instrument Grading

Currently, with humans grading beef carcasses, both the General Accounting Office and the office of the Inspector General report approximately a 20% error rate in the grading of beef carcasses. Table 7 shows the reported error rates in a study done by the General Accounting Office[6]. To minimize errors, USDA is currently working on a videocomputerized grading instrument designed to aid the beef grader and improve his objectivity. An instrument of some type, either this one or one utilizing other techniques will be developed. This will improve the credibility of the grading system and potentially facilitate a marketing system that will more accurately reflect the true value of the product produced. Such a marketing system would greatly encourage more rapid improvement in production practices.

Summary

Current changes in the beef industry and the type of product produced is largely a result of economics. This probably means that the rate of change in production and consumption patterns and preferences will accelerate. Many of the changes mentioned here will occur simply because most of them result in improved economic efficiencies.

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Table 6. Current Typical Price Differentials Between Carcasses of Different Weight Categories and Yield Grades[1]

Carcass Weight Categories	Price Differentials/cwt. Assuming Choice or Prime Quality Grade[2]				
	Yield Grade 1	Yield Grade 2	Yield Grade 3[3]	Yield Grade 4	Yield Grade 5
Under 500 lb.	Same as Y.G. 2	+0.00 to $1.00/cwt.	-0.00 to $3.00/cwt.	few if any produced	few if any produced
500-599 lb.	Same as Y.G. 2	+0.00 to $1.00/cwt	±1.00 to 2.00/cwt	-$4.00 to $14.00/cwt.	-$6.00 to $16.00/cwt.
600-700 lb.	Same as Y.G. 2	+0.00 to $2.00/cwt.	0.00	-$4.00 to $14.00/cwt.	-$6.00 to $18.00/cwt.
700-800 lb.	Same as Y.G. 2	+0.00 to $2.00/cwt.	0.00	-$4.00 to $16.00/cwt.	-$6.00 to %18.00/cwt.
800-900 lb.	Same as Y.G. 2	+0.00 to $2.00/cwt.	±$1.00 to $3.00	-$4.00 to $16.00/cwt.	-$6.00 to $20.00/cwt.
900 lb and over	Same as Y.G. 2	+0.00 to $1.00/cwt.	-0.00 to $6.00/cwt.	-$6.00 to $18.00/cwt.	-$6.00 to $22.00/cwt.

1) Price differentials by weight vary from 600 to 800 lb, choice, Yield Grade 3 beef carcass depending upon market conditions. When the majority of cattle being killed are light weight, price premiums for heavy weight carcasses develop and discounts for yield grades 4 and 5 become less. When the majority of cattle being killed are heavy, price discounts for heavy weight carcasses occur, discounts for yield grade 4's and 5's increase and price premiums for yield grade 2's become more common.

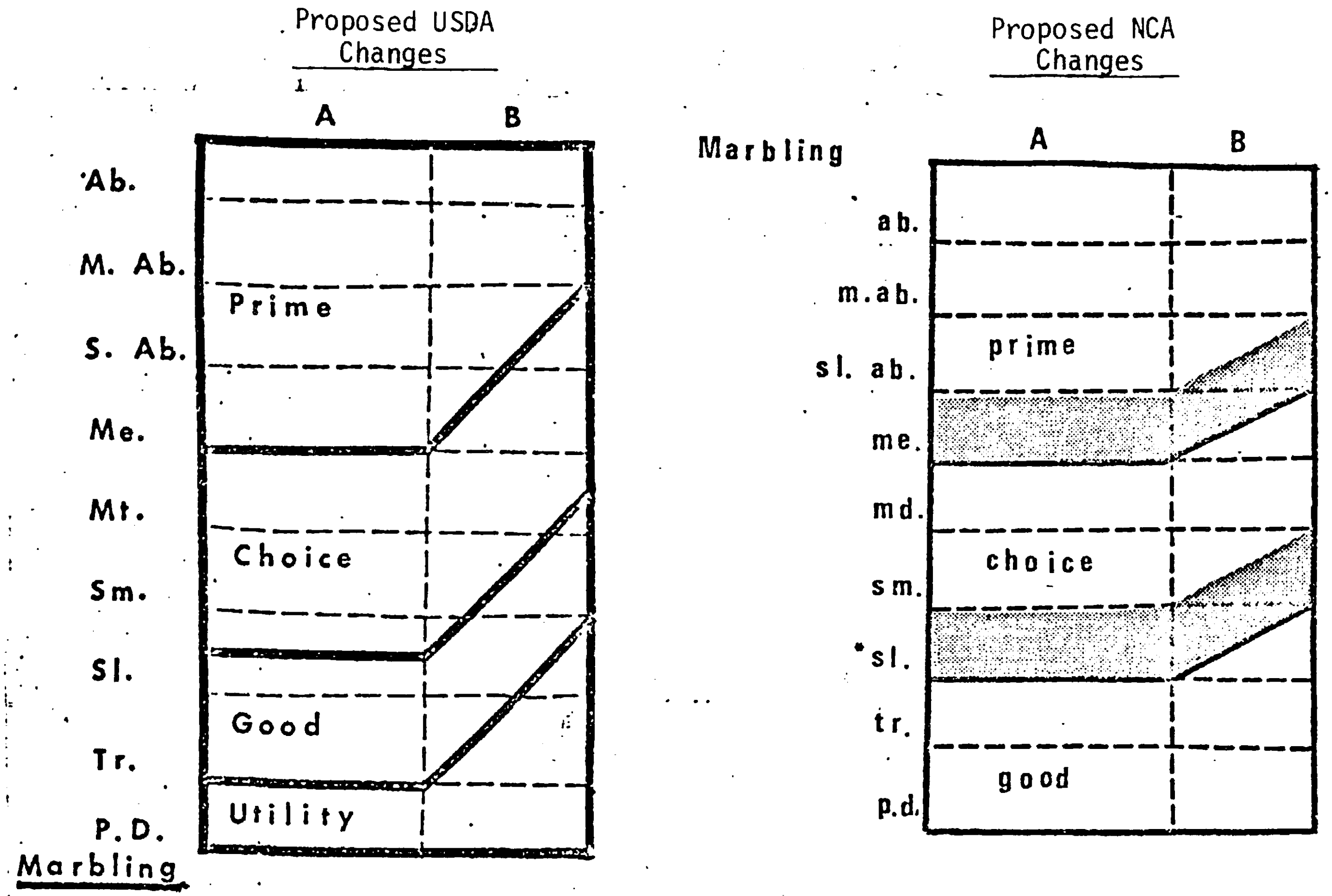
2) Carcasses that do not qualify for the Choice or Prime Quality grade are discounted normally from $1.00 to $6.00/cwt. depending upon market conditions.

3) All prices are plus or minus differentials from a Yield Grade 3 carcass of comparable weight.

Table 7. Grading Errors for Quality, Yield Grade and Both in Six USDA Meat Grading Mainstation Regions.

Main Station	No. carcasses Regraded	Quality Errors	Yield Grade Errors	Both Grades in Error	Total Errors	% Error
Omaha, NB.	354	34	35	3	72	20
Amarillo, TX.	246	48	15	1	64	26
Kansas City, MO.	260	22	20	2	44	17
Martinez, CA.	499	44	52	5	101	20
Princeton, NJ.	419	44	53	8	105	25
Chicago, IL.	437	38	46	4	88	20
Total	2,215	230	221	23	474	21

Figure 1. Proposed USDA and NCA Quality Grade Changes-1981.



*1) Minimum of 0.3" outside fat.
2) White to slightly yellow outside fat.

Figure 2. Current and Suggested Relationships Between Preliminary Yield Grade and Carcass 12th Rib Fatness.

Current

Fat thickness		Preliminary yield grade
0.0		2.0
0.1	Yield	2.25
0.2	Grade	2.50
0.3	2's	2.75
0.4		3.0
0.5	Yield	3.25
0.6	Grade	3.50
0.7	3's	3.75
0.8		4.0
0.9	Yield	4.25
1.0	Grade	4.50
1.1	4's	4.75
1.2 & up	Yield Grade 5's	5.0 & up

Suggested

Fat thickness		Preliminary yield grade
0.0	Yield Grade	2.5
0.1	2's	2.75
0.2		3.0
0.3	Yield Grade	3.25
0.4	3's	3.50
0.5		3.75
0.6		4.0
0.7	Yield Grade	4.25
0.8	4's	4.50
0.9		4.75
1.0 & up	Yield Grade 5's	5.0 & up

Figure 3. Canadian Grading System (A and B Representing Quality Levels, 1, 2, 3 and 4 Yield Grades).

CANADIAN SYSTEM

	Young Grades					Mature Grades		
Hot Wt	A1	A2 B2	A3 B3	A4 B4	B1	C	D	E
-499	.2-.3	.3-.5	.5-.7	.7>	.1-.3			
500-699	.2-.4	.4-.6	.6-.8	.8>	.1-.4			
700-	.3-.5	.5-.7	.7-.9	.9>	.2-.5			

A must have 1) minimum slight marbling, 2) bright red and firm lean, and 3) white, firm fat.

Figure 4. Suggested New Grade Within Current USDA Grading System.

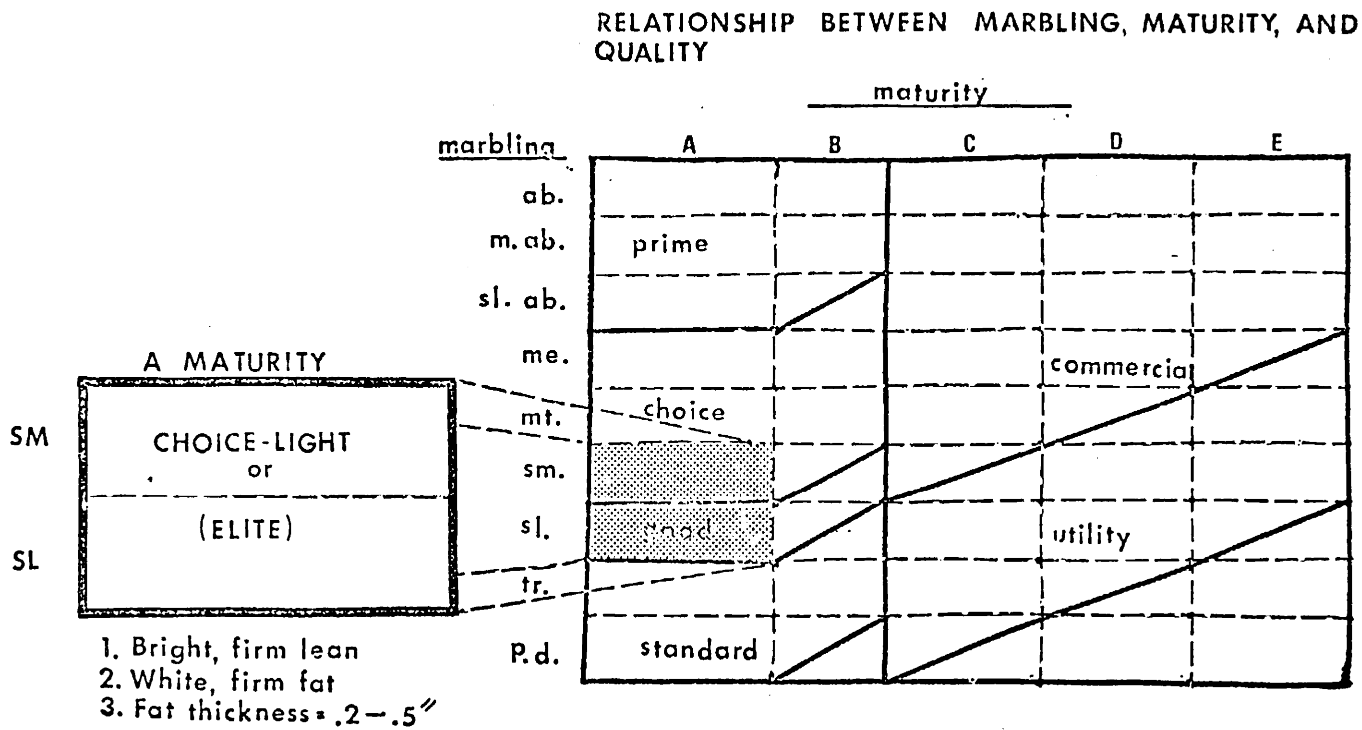


Table 1. Composition of Yield Grade 2, 650 lb. Beef Carcass

Component	Total wt(lb.)	Lean(lb.)	Fat(lb.)
Roasts	226.8	181.2	45.6
Lean trim	225.6	169.2	56.4
Fat trim	64.4	--	64.4
Kidney fat	20.2	--	20.2
Bone	113.0	--	--
Total	650	350.4	186.6

Table 2. Graded Beef-1981 (12.118 billion lb.)

Quality Grades

Prime - 5.2%	Commercial - 0.2%
Choice - 90.4%	Utility - 0.5%
Good - 3.6%	Cutter - >0.1%
Standard - 0.1%	Canner - >0.1%

Table 3. Graded Beef-1981 (12.118 billion lb.)

Yield Grades

U.S. #1 -	1.9%
U.S. #2 -	30.3%
U.S. #3 -	57.2%
U.S. #4 -	9.4%
U.S. #5 -	1.2%

Table 4. Edible Portion and Fat Trim Yields by Yield Grade

	2	3	4	5
Total Roasts and lean trim (25% fat)	69.6	65.7	62.7	59.8
Total Fat Trim	9.9	15.3	17.9	21.8

Table 5. Fat Production Above Yield Grade 2 Level (9.9% Fat Trim and 25% Fat Content in Lean Trim)

Yield Grade	Excess Fat Trim (lb.)
3	374,129,840
4	91,224,080
5	17,733,975
Total	483,087,895

BUYING BULLS AND A PROGRAM

Mike Wheeling
Sidney, Montana

Some people in the beef industry today treat their occupation as a way of life. However, economics in the 1980's is making it tough to stay in the business and we all are going to have to become more profit-minded. We as cattle breeders, need to emphasize the economically important traits.

In 1964, my parents realized the need to make more money, and they strived towards increased milk production and a shorter calving season, and they made remarkable progress. But the quest for bigger calves resulted in some problems. They didn't really come to light until 1976, when we bought my grandfather's place, and we came home to help run the operation. In 1977, we learned the hard lesson that dead calves don't pay any bills. We ended up working for our cattle instead of them working for us. Along with that, we had functional problems that took up a lot of valuable time. Our first priority became "get a live calf out of every cow and make sure she can raise it".

In 1977, we purchased new bulls with known birth weights to breed our heifers to. Since then we have mated the lightest birth weight bulls to the heaviest birth weight heifers and vice versa, and we have been successful in moderating our birth weights. We now take birth weights, calving ease, and vigor scores along with weaning weights and the calving interval on each cow. During some bad weather one spring, we lost a lot of money finding out that there are differences between sires in calf vigor. We took frame scores last year to use as a merchandising tool. We also have scored cows' udders.

Based on these performance records, how then do we select bulls? The single most important thing we do is associate with a breeder whose philosophy agrees with ours. In his breeding program, the function comes first and the form second. The criteria we have in mind are, first, that the bull has a functional mother. Second, the birth weight of the bull ranges from 70-85 pounds and it is helpful when the average birth weight of the sire's and dam's progeny are available. Third, scrotal circumference must be 38 cm. or above because of the high correlation between scrotal circumference to age at puberty in the daughters. Fourth, we prefer maternal breeding values in the range of 104-110. Fifth, we like weaning and yearling indexes above 100. We then supply our breeder with a sire summary with information on birth weight, weaning weight, and weaning index. We also provide calving ease scores on those bulls used on 2-year-old heifers. Two years later, we include a summary of how the daughters performed. We evaluate them for birth weight, percent assisted, percent calved in the first 30 days of the calving season, and weaning index.

Using these multiple traits in the selection of our bulls has resulted in less work and more profit. For example, in 1981, we calved out 71 two-year-old heifers with no losses at birth and 67% calved unassisted. We had a net loss of 1 calf at birth and 2 calves from birth to weaning in the entire herd of 335 cows and a 93% calf crop based on numbers weaned per cow exposed to a bull. Two-thirds of our 2-year-old heifers calved in the first 30 days of the calving season. Weaning weights have consistently gone up by at least 20 pounds per year. In a year of depressed feeder calf prices, our total sales for feeder calves was down only 4% from the year before. We attribute that to heavier weights and more calves weaned.

In concluding, I would like to leave you with these points. In the cattle business, the need to measure the economic traits is greater than ever before because profitable cattle cannot be put into simple categories like frame, color, or even weaning and yearling weights. Commercial cattlemen vary a great deal from a guy who wants a bull to just freshen the cows to a guy who wants extensive data. The ideal program furnishes as much data as possible and therefore, allows him to make the best decisions for his operation. Communication of this data is a necessary tool in the success of all facets of the industry.

Preweaning Performance by Sires

Sires	Number Of Head	Birth Weight	Weaning Weight Ratio	Frame Score
A	21	93	109	4.87
B	14	89	106	4.78
C	16	92	111	4.58
D	19	75	98	3.78

Production of 2-Year-Old Daughters

Sires	Number	Birth Weight	Percent Unassisted	Percent Calved In 1st 30 Days	Index
A	31	83	84%	84%	102.9
B	11	78	37%	58%	103.3
C	11	77	82%	50%	95.7
D	6	86	17%	43%	97.0

PERFORMANCE BASED ON HARD FACTS AND THE UTILIZATION OF THOSE FACTS

Bill Rishel
Nebraska

The name of my game is converting seedstock cattle to cash, and today is payday. There is no miracle method to selling performance - during harsh economic times, it sells the fastest. But it always sells at the highest price when you have it in a form that functions the best for the commercial cowman.

You people in the beef cattle industry who have been the force behind performance testing and performance programs can congratulate yourselves on the advancement that has been made in the industry in the area of performance.

The pursuit of performance hasn't been without its pitfalls, and we've all seen herds of cattle or programs that have been bred into oblivion by chasing after one trait, like A.D.G., and ending up with bulls from purebred herds that were not acceptable in the commercial industry because their calves were not acceptable to the feeders. They gained fast, but were early maturing, small framed and produced a small carcass. They were not functional in the industry.

What does this have to do with selling performance? I believe that to sell performance in today's industry (and we are looking at this from the seedstock producer's viewpoint) you must be dedicated to selling a total performance package. We must constantly strive to incorporate as many of the economically important traits into our program as we possibly can.

There seems to be more purebred herds of cattle than ever before, and most certainly more breeds of cattle than a few years ago. This means there is more competition among seedstock producers to produce a product that is acceptable to the commercial customer. The seedstock producer who designs the most "Total Performance" into his product is most likely to have his fair share of the market place.

When you are selling your performance program, be it through sale catalogs or private treaty, you must have the horse hitched properly in the harness.

1. Before you can do a good job of selling your product in your catalog, you must have some resemblance of a performance program. I had a breeder tell me once that he sold his cattle for big money, and that was performance. He was not even on his breed's performance records program. I'm saying to you that his attitude is a short-sighted and short-lived approach to the long-term proposition of breeding cattle and selling germ plasm.

2. The more complete the performance information is that you present in your sale catalog, the more likely you are to be successful: birth weight - calving ease - age of dam - 205-day weight and ratio - 365-day weight and ratio - weaning, yearling and maternal EBVs - dam's reproduction - scrotal circumference - hip height adjusted to a year of age - frame score.

There are many types of cattlemen in the commercial industry with different ideas about what they need from bulls to fit their cow herds and make a profit. I'd like to take some of my experiences and observations as related to acceptance by commercial cattlemen through sales.

We have all agreed that calving ease is a very important performance trait, but we have tended to tie it directly to birth weight because birth weight is something we can measure. We also pretty much agree that heavier birth weights and high performance or rapid growth go hand in hand.

To this point in time, I have seen performance-oriented commercial cowmen who want to buy high growth rate bulls willing to accept slightly heavier birth weights to get the desired performance, and pay a premium for the bulls.

I have also heard more commercial cattlemen in the last 12 months saying there is more to calving ease than just birth weight. They are talking about the shape of their calves and the size of the pelvic regions of their cows. There's one commercial cowman in our area who has the local vet take fist and thumb measurements of pelvic area on their yearling heifers. It's crude, but they have eliminated most of their calving difficulty in first-calf heifers.

Now on the other side of the coin we have some commercial cowmen telling us, at least in the Angus breed, that we're getting these calves too big. There are very few instances where I've seen a man who is adamant about light birth weights willing to pay a premium for them. Many times he wants them to freshen his heifers, and the bull then has little performance value to go into his cow herd as a two or three year old.

So in order to sell performance at a premium, the best method we have to date is to list a calving ease score and perhaps age of dam along with birth weight, and probably do a better job in our sale catalogs about the influence of female size, nutrition and even exercise on calving ease.

Probably the most thoroughly accepted performance traits we can sell today are 205-day weights and 365-day weights and ratios.

Just three short years ago, ratios were little understood by many commercial cattlemen. Even if they kind of understood the theory of a 205-day ratio of 110, they didn't seem to be willing to pay enough extra to justify the time involved in gathering them. Well, economics is a powerful force. Today they come to a sale with the lot numbers of the high indexing bulls written down on their catalog cover, eager to see if they suit them in other ways.

The area of weaning, yearling and maternal EBVs is where we probably have the most selling to do in our sales program. I see many commercial cattlemen treating them with the same skeptical eye as they did ratios some years back. As seedstock producers we've got the job of putting more educational material in regards to breeding value in our sales promotion material. The use of Performance Pedigrees is a step in the right direction. The Angus Association, for example, puts out a descriptive breakdown of all the components of a performance pedigree, and we have started using this in some of our sale catalogs.

Now - frame score. If you have frame in your cattle, you will probably be dollars ahead to promote it. If you don't have frame you're probably in trouble. I see too many breeders cuss big-framed cattle and cry the blues because they can't sell their product.

I believe from what we've seen that the commercial industry wants frame with their performance. And I believe that the British breeds as a whole have a long way to go.

Can we get too big? Yes. The environment and management systems of the commercial cattleman who buys our bulls will tell us when we overstep the limits.

(SEE CHARTS FROM 1982 WESTERN NEBRASKA BULL TEST, OGALLALA)

In summary: The information that you print in your sale catalog or advertising is an extension of you and your reputation.

1. Performance information should be accurate and honest. It must be believable.
2. Keep it as simple and concise as possible.
3. Utilize your sale catalog as an advertising tool of your total program.
4. Last but not least - strive for a total performance program where you are able to demonstrate how the use of these performance figures and concepts worked in your herd.

Your example will be your best sales tool.

PER(FORM)ANCE
FUNCTION

Birth Weight	Calving Ease	Age of Dam	Scrotal
85	1	5	35mm

205 Day Adj. - 610	WR - 106	WBVR - 101
365 Day Adj. - 1020	YR - 106	YBVR - 102
140 Day ADG - 3.20	GR - 107	MBVR - 100
365 Day Adj. Hip - 50.8	Frame - 5.3	

HEREFORD

3.6 - 4.0

8 Bulls
7 No Sale
88%
$650.00

4.1 - 4.5

13 Bulls
6 No Sale
46%
$818.00

4.6 - 5.0

9 Bulls
3 No Sale
33%
$883.00

5.1 - 5.5

6 Bulls
$1,500.00

5.6 - 6.0

3 Bulls
$1,983.00

ANGUS

3.0 - 3.5	3.6 - 4.0	4.1 - 4.5
3 Bulls 3 No Sale 100%	6 Bulls 2 No Sale $781.00	23 Bulls 9 No Sale $873.00
4.6 - 5.0	**5.1 - 5.5**	**5.6 - 6.0**
31 Bulls 3 No Sale 10% $1,018.00	20 Bulls $1,948.00	7 Bulls $1,507.00

CHAROLAIS

4.7 - 5.0	5.1 - 5.5	5.6 - 6.0
2 Bulls $937.00	4 Bulls $1,181.00	13 Bulls $1,187.00
6.1 - 6.5	**6.6 - 6.7**	**7.1 - 7.5**
10 Bulls $1,490.00	14 Bulls $1,351.00	9 Bulls $1,410.00
7.6 - 7.9		
6 Bulls $1,413.00		

Private Treaty Marketing of Performance Cattle

by
David Nichols
Anita, Iowa

First of all, let me tell you that I'm really uncomfortable talking about merchandising because we really don't do a very good job of it. If you want to find out who the expert on merchandising is, get the guy who sells the unborn embryo out of the non-performance tested cow that's had both eyes removed for cancer eye, has prolapsed 4 times, and is selling that embryo for $170,000. That guy's the merchandiser!

The only thing I can tell you about are my experiences with our own herd and the way we sell cattle. I think that whenever you go to sell cattle, the first thing you have to do when you're selling seedstock, is ask yourself, "What have I got to sell?" The second thing you ask yourself is, "Who am I going to sell it to?" Now I don't think that it just happens by chance that all the McDonalds stores are on busy streets where all the kids drive. I think someone figured out that would be a pretty good place to put a store. I think you ought to figure that out in your seedstock business. You ought to figure out what you have to sell.

Now, I'm real lucky in a lot of ways, but one way I'm lucky is because I'm involved with a whole bunch of breeds and I can make fun of all of them, so I'm not picking on anyone. I realize that I'm following a professional in the cattle sales management business, Bill Rishel, one of the really good sales managers in the business. However, I would like to do one thing. I would like to go to these purebred cattle meetings and I would like to tape record the conversations that take place. Then I'd like to bleep out the breed. I'll start with my first breed, the Angus. I saunter back to the bar and I notice the guys there in their cowboy boots, and this one guy says to the other, "Yeah, I've got a calf at home and he's a good calf. I'll tell you, is he good! At weaning time he measured 64 inches at the shoulder. At 11 months, I think he'll make 67 and he'll make a 4700 pound bull. He's what I call a big frame bull." Now you'd swear you were at a Chianina meeting, because all the Angus people talk about are the big framed ones they've got at home. So I say enough of this foolishness and I walk over to my friends the Polled Hereford breeders. I see two of them standing back by the bar, and one says to the other one, "Does his mother milk? The calf could only nurse one quarter, we feed the two hired men's families off another quarter and merchandise 10,000 pounds milk off the other half." You'd swear you were at a Holstein meeting because everybody's got these great milking Herefords. So then I go to my Simmental meeting and I say, now here's a group that's steeped in the tradition of performance. I walk back to this guy and he says, "Calving ease. Let me tell you about my bull. This neighbor of mine had some 320 pound short Hereford heifers that he bred to my Simmental bull, bred 600 of them. They were weighing about 420 when they calved and he pulled one, but he didn't think he would've had to."

Let's get serious and sell people what we have to sell. I sure agree with Bill Rishel that we need to have frame in our cattle. I think that the commercial man's doing it right. In our herd, he's using frame as an independent culling level. He won't look at one (we don't measure, but I'm guessing) under around a frame 4.5 - 5. If he's below that, they've got a whole bunch of cute names for them: shorts, stubbies, none of them call him very early maturing. They call them shorts. Then they buy what's left on performance.

Now, my purebred friends come in with grandiose breeding programs. The truth of the matter is, they'd give anything for another inch of height. If the tallest bulls are out there, they pick out the tallest one. I don't care how many bad calves his mother's had or anything else about him, he'll find some redeeming quality about that bull before the day's over so he can justify buying it.

I think in the commercial business, we need to be looking at culling levels. The commercial cattleman wants a culling level on birth weight, a culling level on frame, and even some culling levels on performance. I don't like it, but the truth is you cannot sell a bull that has a birth weight over 100 pounds, you cannot sell a bull that has weaning weight below 500 pounds, a rate of gain below 3 pounds, or a yearling weight below 1000 pounds. So in our herd, we have our management system on rate of gain, etc., so that we don't have many that are below that figure, because in Iowa a 500 pound calf and a 1000 pound yearling is the culling level. You can have all the ratios you want, but they don't look at ratios until you get to that point.

Now, this is where I disagree with everybody here. I think the public auction is the stupidest, most backward way to sell seedstock that's ever been invented. I know a lot of people feel they have to do it, but I'll tell you what. When Monsanto gets overstocked on Lasso, when is the last time you can remember they stacked the cans up in back of the dealer and said all you farmers come in here and decide what it's worth. That's not the way we buy products. The way we buy products is this: cost plus. It's labor, it's interest, it's return to management, plus a profit. They price the Lasso or the Atrozene or the fertilizer or the diesel fuel that way, and they sell it. We go in and we buy it. Oh sure, we put on our trading clothes, and we go in there and think we made a big deal because we bought $10,000 worth of Lasso and they gave us 1% off or something. But really, we're dealing with a product that is priced according to its value.

We, at Nichols Farms, think we know more about our cattle than anyone else. We know their value better than anyone else, therefore, we should price them. We don't think the public should price our cattle, and we're not going to let the public price our cattle. You know, in theory, we should price them just high enough so that on the 23rd of June we sell the last bull. We don't even believe in doing that. We believe in pricing them fairly so we make a fair profit. There've been a lot of years that we've been sold out of bulls way, way too early. We have never priced our bulls too low -- we just didn't have enough to sell some years. That's the reason, I guess, that we've come from selling twelve bulls to this year we're selling about 380.

We have another concept. We don't think that we should sell the man the bull he wants. We think we should sell him the bull that he needs. When we go to buy a pickup truck, we go to this dealer and we don't say, "I want a Ford F-350 with overload springs with a 9 foot box and a four speed transmission with a 4-11 rear-end in it. We don't know what we want. I go in to a dealer I can trust and say, "I want a pickup that I can pull a trailer with, haul fertilizer, and still the wife can take the kid to school once in awhile." He lists the things I need, and he'd better list the right things I need because I'm going to be buying another one next year.

We've got a rule at Nichols Farms that the only people that we will sell an Angus bull to that have Angus cows, are either a registered breeder or a qualifying commercial man. A qualifying commercial man is straightbreeding, is one that inherited the farm from Grandpa and his wife has a good job in town because, he's the only guy who can afford to straightbreed. What we do when that man comes in and we've got three breeds for sale, all three priced the same, and all priced by performance and he wants to buy an Angus bull. We walk him down to the Hereford pen. We find out what he wants his cattle to do for him; what deficiency he needs to correct. If he wants frame and milk, we damn sure don't take him in the Hereford pen, we take him in the Simmental pen. If he comes to buy calving ease to breed his yearling heifers that were a little short on feed last winter and he's sure been having trouble, we darn sure don't take him in the Simmental pen. In fact, we will not sell a Simmental bull to be used on yearling heifers. We take him in the Angus pen and we look at the birth weights and try to sell him the bull that will give him the least amount of calving trouble.

We like to tell people we're selling results. We think this is the kind of rapport that we have with our customers. Back in the sixties, when everybody said you can't sell performance, they won't pay for performance, they can't understand 205-day weights, and all these things, a lot of people came to our place that didn't understand 205-day weights, gain ratios, and yearling weights, but whether he bought a bull or not, he darn sure understood it when he left. And, you know what? He'd drive down the road to go to that other place where he could buy them a little cheaper and this guy'd say, "Oh, those crazy records that have just been dreamed up by old Willham and a bunch of those other guys that don't have any manure on their boots and don't amount to anything." He'd get to thinking about it and he'd turn around, and he'd come back up and buy a bull from us.

I think to have the right kind of relationship with your customers, don't expect them to be genetic experts. I think the purebred seedstock man and his advisors from his breed association, people like Richard Willham, and others are the ones that should be the genetic experts.

When I go in to buy a herbicide for corn, I want to know what it will do; I want to know what weeds it will kill; I want to know what weeds it won't kill. I could care less what the chemicals are that are in it, or the process that made these chemicals. I want to know what the results will be.

The next thing is, who do you want to sell your bulls to and what kind of price do you want to have for them. Our philosophy is it'd be easier to sell 300 bulls for $2,000 a piece for $600,000 than it is to sell 2 bulls for $200,000 each. So, we set off to sell moderately priced bulls that anyone can afford. We advertise. We don't buy the concept that if you build a better mousetrap, the world will beat a path to your door. You'd better build a better mousetrap and then you'd better advertise that you've got a better mousetrap, and, if necessary, you'd better hire somebody to go show your mousetrap to people.

We set out to spend 10% of our gross sales on purebred cattle advertising. You know what? We can't spend that much because we run out of cattle before our advertising's done. We don't have enough cattle. When you look at people out there in the seedstock business (and it's not uncommon to have from $2-5 million invested in land and cattle) and they won't buy a $500 ad or promote their product, or tell people what they have to sell. We run a lot of ads in local or state-type newspapers. These ads are built around what we have to sell, which is performance, calving ease, and maternal rates. We put in our ads what the prices of our cattle are and these are aimed at the commercial man. We advertise a full page in each of the breed journals that we're involved in, a full page, 4-color, twelve times a year, and we're selling semen in those ads, so those ads are charged to our semen account.

Then we did something else and this is what I want to show you a demonstration of. We have to tell more people about these great Nichols cattle whenever they're having a hay baler demonstration or a machinery show or something. The only place I know where you can't find a commercial cattleman is at a cattle show. You'll find all your competitors there and a lot of them will try to sell you a bull and you can try to sell them one, but the one place you can't find a commercial cattleman is at a livestock show. Now, I enjoy livestock shows, and I've got a 14 year-old son who thinks heaven is covered with 6 inches of tan bark, but the fact of the matter is that if you want to sell cattle to commercial men, don't go to cattle shows because he isn't there. Go to the places where he is. The places where he is are out looking at a new hay baler, at cow-calf conferences where extension people are, and so on. So we rent a booth, or we rent a patch of grass, and we want to get right next to the newest hay making machine that will save him the most labor, with a cab on it so his wife can run it. I guarantee you that that's where most of them will be. We put up a booth, a live animal display, and we tell him why it would be a better deal for him to buy a Nichols bull than it would anything else.

So, this last year I put together a slide presentation on why these people should buy a Nichols bull. Now, I promise you that I'm not trying to sell any of you here a bull. I'm only going to run this thing so you can see how we try to sell bulls to commercial men and the promotional tools that we use. We put out a new brochure every two years, we invite tourists to come by our place, and when the tour comes by our place between the hours of 11 and 1, I guarantee they're going to get fed, and they're going to get fed at Nichols' expense, and it's going to be pretty good stuff -- we like to have people come by. This is one of the promotional tools we use, so I'm going to switch this thing on. If anyone's offended by the hard sell or thinks I'm trying to sell a bull, why they can just give me hell later on.

Thank you very much.

COMPUTERS IN AGRICULTURE --
A LOOK AT TODAY AND A PEEK AT TOMORROW

A Slide Presentation by Harlan Hughes

(Slide Set 1.0)

AGNET Coordinator

University of Wyoming

Laramie, Wyoming

Paper Presented at "Managing Farm Technology", Seminar, Saskatoon, Saskatchewan, February 2 and 3, 1982.

COMPUTERS IN AGRICULTURE -- A LOOK AT TODAY AND A PEEK AT TOMORROW

by

Harlan Hughes[1/]

INTRODUCTION

SLIDE 1 -- AGNET - A MANAGEMENT TOOL FOR AGRICULTURE

In the early 1970's, two professors at the University of Nebraska conceived the idea of an agricultural computer system designed specifically for farmers and ranchers. They developed the computer system now known across the country as AGNET--The Agricultural Computer Network. In 1977, the Governors of five states (Nebraska, South Dakota, North Dakota, Montana, and Wyoming) jointly funded a pilot project to test if farmers and ranchers in their respective states would use a computer system to make better management decisions. AGNET has now developed to where there are over 400,000 calls a year being made to the AGNET computer.

Wyoming now has computer terminals in all 23 county extension offices and county extension agents are now receiving training on how to use these terminals with their farmer and rancher clientele.

SLIDE 2 -- OPERATOR AT AGNET'S CONTROL COUNCIL

AGNET is one of three computers in this computer center. This operator controls the AGNET computer from the central council in this picture. If we have done our job right, the operator should not have to do much. Due to the speed of the machine, we prefer that the machine do as much of its own operation as possible. This operator, however, can and does take over control of the machine whenever necessary.

SLIDE 3 -- AGNET'S MASS STORAGE CAPABILITY

AGNET is a mass storage system. Behind the dark windows are stacks of phonographic records used for storage of data and programs. We have all of AGNET's programs stored on these disks so that when you type in the name of a program, the computer can immediately go to the appropriate disk and find the requested program. We do not have to wait for an operator to mount a tape or to do any manual intervention. AGNET is one of the largest mass storage systems in the world.

SLIDE 4 -- THREE PEOPLE STANDING IN THE COMPUTER CENTER

The gentleman with the sport coat is a very special person to AGNET. He is a farmer--and he is also on the AGNET payroll. George is a real character and I sure wish I could have brought him here for each of you to meet. George's role is to help make sure that what we have on AGNET will work for farmers and ranchers. I have heard George say, "Harlan, that is the dumbest #%&"* thing I have ever heard!" Or I have heard George say, "That may be well and fine in your ivory tower, but out on the farm we do not have that kind of data." We have two half-time farmers on the AGNET payroll and they play a very important and unique role in the design and operation of the total AGNET system.

SLIDE 5 -- THE COMMUNICATIONS EQUIPMENT

AGNET is set up so that we can have over 200 telephone calls coming in to the computer at one time. We are now averaging a phone call into AGNET every four minutes, seven days a week, 24 hours a day. That is over 400,000 phone calls a year.

SLIDE 6 -- NEBRASKA'S STATE CAPITAL BUILDING

The AGNET computer is located in the basement of the Nebraska State Capital. AGNET is not on a University campus computer by design and probably never will be on a campus computer due to our computer needs and demands. A University computer is set up for research and administrative data processing. We need a service oriented computer center that can consult us before the system is changed or shut down. Our users are not computer

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science PhD's and will become frustrated with computer down time or off time. AGNET is often our user's first contact with a computer and since they are paying for the computer time, we place some stringent demands on the computer center.

SLIDE 7 -- MAP OF FULL PARTNER STATES

In 1977, five states became full partners in the AGNET system. The best way to describe a full partner state is to say that each state has a member on the AGNET Board of Directors.

In July of 1980, the state of Washington joined as a full partner state and in October, 1980, the state of Wisconsin joined AGNET. In July of 1981, Wisconsin withdrew, leaving six full partner states currently in the AGNET system. There are currently other states considering partner status, but nothing firm at this time.

SLIDE 8 -- AGNET STAFF AT A TABLE

The concept behind AGNET is to share the development and operating costs among the full partner states. There are approximately 17 people on the AGNET payroll. Out of this seventeen people, Wyoming is paying for two. In a small state like Wyoming, we could not afford a large payroll, but we can afford to share the salary of the 17 people with six other states. Each state pools its resources with the other states so that each state can take advantage of the total efforts of the total 17 people.

I have a goal in life and it is to dissolve state boundaries--when it comes to information. Nebraska has some information that can be used in Wyoming and I believe that Wyoming has some information of use to Nebraska. We are proving that you can share information and computer programs across state lines. Each state does not have to spend resources to reinvent the wheel. In fact, I assure you that Wyoming does not have the resources to reinvent the wheel! We need to share extension resources with other states. The real winners of this sharing are our clientele.

SLIDE 9 -- AGNET PROGRAM LIBRARY

The six partner states in the AGNET system have developed the world's largest agricultural and home economics computer program library in the world. Today there are over 200 programs available to AGNET users. With a library of this size, no one is expected to use or even know how to use all the programs.

Our goal is not to have users able to use all the programs in the library, but rather to have a large enough library so that every user can find at least one program of interest. This large smorgasbord of programs means that users should be able to find several programs of special interest. Appendix I provides a partial list of the programs available on AGNET. I have grouped the programs by subject matter grouping to facilitate user interests.

SLIDES 9A THROUGH 9H -- PROBLEM SOLVING APPLICATIONS ON AGNET

The AGNET library has been put together with approximately 35 man years of programming effort. In addition, each program development is supervised by a subject matter extension specialist that is responsible for the subject matter content of the program. The program is owned by the subject matter specialist and not by AGNET. AGNET owns no subject matter programs.

AGNET is exceptionally well equipped for the livestock producer. There are livestock ration formulation programs available for range cattle, feedlot cattle, hogs, sheep, and poultry. There are programs available that will let you simulate on paper what your cattle will do in the feedlot given a description of your cattle and the ration that you are going to feed them. There are livestock budgets and planning prices stored in selected programs.

AGNET also has programs for the crop farmer. Machinery cost calculators and crop budgets are available. In addition, there are whole farm or ranch budgeting programs designed to help you make long-run business investment decisions. There are many, many more programs designed to help you make better management decisions.

Let's now look at some of the hardware that is being used to access the AGNET library.

SLIDE 10 -- TOUCH TONE TELEPHONE

The first computer terminal that I installed in a county extension office in 1972 was a touch tone telephone. It cost us $14 per month. We used the number-pad to send information to the computer and the computer sent back the information over the special loud speaker attached to the phone. We would send in the input numbers by typing them into the telephone. The computer would talk back and say, "Answer number 1 is 420." We print the answer onto a preprinted form which explained the interpretation of the number. This touch tone terminal served us very well as a low cost computer terminal. Industry still uses this type of small, low cost terminal.

SLIDE 11 - EXECUPORT TERMINAL

It soon became evident that we would like to have terminals in our county extension offices that would print out the computer information. We now have five of these Execuports in the Wyoming AGNET inventory. These cost us $1,400 for reconditioned terminals.

SLIDE 12 -- TEXAS INSTRUMENT 745 TERMINAL

We have installed these small portable TI-745's in most of our extension offices. They weigh approximately 13 pounds and can easily be moved around.

SLIDE 13 -- TI-745 WITH LID AND HANDLE

The TI-745 has a lid that clamps on and has a handle on it. It is the size of a small briefcase and weighs about half as much as my briefcase. Wyoming agents transport their terminals all over their counties. The TI-745 costs approximately $1,400 new.

SLIDE 14 -- NORTH DAKOTA'S CRT TERMINAL

Terminals come in all sizes and shapes. This is a terminal used by the Animal Science Department at North Dakota. Note that it has a TV screen where one can read the data. It also has a printer that can be used to generate a printed copy of the output when desired. These dual purpose units cost more money, but the flexibility is convenient and does reduce paper costs.

SLIDE 15 -- ALBERTA AGRICULTURE'S TERMINAL

This is a decwriter terminal that the Department of Agriculture in Alberta, Canada, uses. I was there one time and needed to check my electronic mail so I used their terminal. Alberta Agriculture subscribes to the AGNET system. This terminal costs around $2,000.

SLIDE 16 -- MY SECRETARY WITH TELETYPE 43 TERMINAL

This is my secretary with her Teletype 43 terminal. This is the terminal that is also on my desk so you can see that this is the terminal that I like best. These TT-43's get used more hours than any of our terminals and it is virtually a maintenance-free terminal. The only problem is that they are not portable. They weigh 45 pounds and you have the terminal plus the telephone coupler to move. In addition, the paper has to also be moved making a total of three things that you have to move. This terminal also costs approximately $1,400.

SLIDE 17 -- ADDS TERMINAL WITH TV SCREENS

We have one special terminal that drives 23-inch TV screens for demonstration and teaching purposes. These are the same TV screens that you see in airports with flight schedules. We use these screens so that clientele and students can see exactly what we type on the terminal and exactly what the computer sends back to the screens. These screens have done a lot to help promote AGNET in Wyoming. The screens work so well that I will not give a demonstration without these screens. The special terminal and the two screens cost approximately $4,000; therefore, we have only the one in Wyoming.

SLIDE 18 -- FIRST NATIONAL BANK'S TERMINAL

This is a special terminal that has a TV screen and the printer all in one unit. I found this terminal in the First National Bank in Fort Collins, Colorado. This terminal costs around $7,000 so you find't find one of these in public offices. It is a nice terminal but before you spend $7,000 for a terminal like this, there is a whole new technology that

I would like to show you. This technology is the microcomputer that you are reading and hearing so much about.

SLIDE 19 -- RADIO SHACK CHRISTMAS ADVERTISEMENT

In late fall, 1977, Radio Shack started advertising the TSR-80 microcomputer for Christmas. This started making the general public aware of the personal microcomputer.

SLIDE 20 -- ATARI MICROCOMPUTER HOOKED TO A COMMON TV

This is an Atari computer that is hooked up to a regular TV. This is a stand-alone computer. Atari's have historically been a game computer and, to my knowledge, there are no agricultural programs available for the Atari microcomputer.

SLIDE 21 -- TI-99/4 MICROCOMPUTER

Texas Instruments came out with its 99/4 microcomputers. Texas A & M arranged to work with TI to test the 99/4 in agricultural applications. After several months of research, it was decided that the 99/4 was not suited to agricultural applications. TI has now designed the 99/4A, but I am not familiar with anyone looking seriously at the 99/4A for agricultural applications.

SLIDE 22 -- RADIO SHACK MODEL I

The Animal Science Division at the University of Wyoming has a Model I Radio Shack microcomputer. As is typical of most microcomputers, it has a keyboard, a TV screen, a disk unit, and a printer.

SLIDE 23 -- DR. SCHOONOVER AND RANCHER

Dr. Schoonover from Wyoming has developed a Herd Performance program for the Radio Shack Model I and III microcomputers. This program keeps track of the cow/calf information that ranches have been keeping on 3- x 5-inch cards. Once the data is inside the computer, management reports can be quickly printed out helping the rancher determine the cows to keep and the cows to cull.

SLIDE 24 -- BHPP & BHAP

The same herd performance program that Dr. Schoonover has on the Radio Shack microcomputer is also on the AGNET system. We have several Wyoming ranchers currently using these herd performance programs.

SLIDE 25 -- RADIO SHACK MODEL II

This is a picture of the Radio Shack Model II. Note that the disk drive is built into the unit on the right. Radio Shack refers to this as their small business machine.

SLIDE 26 -- RADIO SHACK MODEL III

This is the Radio Shack Model III. Notice that it has two disk drives built into the unit. I have this slide in here to illustrate that you can use microcomputers to present pictures and graphs of your data. Graphics capabilities are excellent on microcomputers.

SLIDE 27 -- 2ND RADIO SHACK MODEL III

This slide is in here as another illustration of how microcomputers can be used to present pictures of data. This could just as well be a bar graph of ranch profits for the last five years. It has been suggested by ranchers in previous presentations that the graph is backwards if it represents ranch profits. Profits have been decreasing rather than increasing. My response is that this represents what will happen if a rancher purchases a small business computer!

SLIDE 28 -- AFFORDABLE SMALL BUSINESS MACHINES

While many people like to refer to microcomputers as hobbiest machines, personal computers, etc., I will only refer to microcomputers as "small business computers." I am serious about their use on farms and ranches as small business machines.

SLIDE 29 -- BOOK SHELF IN A COMPUTER STORE

Most computer stores have several books and magazines available on microcomputers and how to use and program them. I strongly encourage farmers and ranchers thinking seriously about purchasing a computer to get one or two magazines or books on microcomputers. Farmers and ranchers read several agricultural related magazines, so why not read at least one computer related magazine.

I personally subscribe to BYTE. It is a good magazine to read to find out what kind of hardware is available. By spending a couple of hours in your easy chair reading a computer magazine, you will start to learn the jargon of computers. It will help out considerably when you walk into a computer store.

I also subscribe to the Personal Computing magazine. It has stories written by people who are familiar with microcomputers for people like you and I who are not familiar with microcomputers. A few magazines will prove to be well worth the time and dollars to learn about this new farm and ranch management tool.

SLIDE 30 -- AGNET'S APPLE COMPUTER

This is Wyoming's Apple computer. Since this picture was taken, we have added a second disk drive. Also, note that we have one of our Teletype 43 AGNET terminals as a slave terminal to the Apple. With proper connections, you can use your existing terminal as a slave printer on your microcomputer.

SLIDE 31 -- DR. MENKHAUS AND HIS APPLE COMPUTER

We are starting to teach undergraduate students how to use microcomputers. This slide shows Dr. Menkhaus using his Apple microcomputer in his Price Analysis class at the University of Wyoming.

SLIDE 32 -- APPLE HOOKED TO BLACK AND WHITE TV

They are trying to make it so that you can use as many common household appliances as possible with microcomputers. If you have a black and white TV you can hook it up as the CRT on the Apple (and other brands, also). The resolution is not quite as clear as a regular monitor, but it is a cheaper way to get set up with a microcomputer.

SLIDE 33 -- APPLE III

The newest Apple is the Apple III. It has been out for about a year, but has had some technical troubles that has set its acceptance back. The Apple company has recalled them several times. The general public has lost some confidence in the Apple III. The Animal Science Division at Wyoming cancelled its order for the Apple III and ordered the Apple II Plus. It appears that a fast growing company having excellent sales, moved into a new product and forgot something called "quality control." It has hurt the sales of the Apple III.

SLIDE 34 -- COMPUTER CONCEPTS STORE FRONT IN CHEYENNE, WYOMING

Another popular microcomputer is the Pet Commodore. The Division of Ag Economics at Wyoming at a Pet.

SLIDE 35 -- PET COMMODORE MICROCOMPUTER

This is a picture of the Pet Commodore microcomputer owned by the Divison of Ag Economics.

SLIDE 36 -- ALBERTA AGRICULTURE PET

This is another picture of a Pet Commodore that is being used by Alberta Agriculture in Canada. They have written a fair amount of agricultural software for the Pet. Fortunately, they have been willing to share that with Wyoming so we do have several decision aids for our Pet Commodore.

SLIDE 37 -- PET WITH WORD PROCESSOR ON SCREEN

This slide is in here to remind me to comment on how micros can be used for word processing. You can buy word processing programs for almost all micros that will let you use your micro to generate printed materials like letters and reports.

Word processing allows you to electronically add words, delete words, add paragraphs, move paragraphs, etc. When you have your paper like you want it, you can print out the letter or paper on the computer's printer. I now write all my papers on the word processor.

While word processing will not be a big thing for many farmers or ranchers, it might be of value to those of you that are officers of farm organizations. I sure can see how Dave Flintner, President of Wyoming Farm Bureau, could use word processing in his Farm Bureau business.

SLIDE 38 -- LEVEL I HARDWARE

There are two levels of microcomputers being considered by farmers. For the lack of any other terminology, I will use "level I and level II' as the classifications. Level I micros are the lowest cost and most popular systems. The three most common level I micros in agriculture are the ones we just looked at--Radio Shack, Apple, and Pet Commodore.

Let's now take a look at some of the level II microcomputers that farmers and ranchers are considering.

SLIDE 39 -- NORTHSTAR MICROCOMPUTER

One level II microcomputer that is fairly popular is the Northstar. While you don't see much of the computer here, my goal here is to get you familiar with the different brands. Country Side Data out of Utah is selling agricultural software for the Northstar computer.

SLIDE 40 -- COMPUTER STORE IN FORT COLLINS

Different computer stores handle different kinds of microcomputers. Here is a store in Fort Collins that handles level II microcomputers.

SLIDE 41 -- VECTOR GRAPHICS MICROCOMPUTER

This is another level II microcomputer called the Vector Graphics. Notice that the disk drive is below the printer. Holmstead Computers out of Canada has several software packages for the Vector. In addition, Loren Bennett out of California has a dairy ration package for the Vector.

A second thing that I want you to notice in this picture is the printer. I call this a "professional" printer. This is the kind of a printer that is used for word processing. If we had a letter typed with this printer, I could convince you that the letter was typed by my secretary on her IBM electric typewriter. Professional printers sell for around $3,000; however, if you are going to do word processing, a professional printer is preferred.

One purebred cattleman has a professional printer on his micro. He uses the word processor to write individual letters to his purebred cattle customers. He keeps a list of potential customers inside his computer. When he has a bull for sale, he then uses the word processor to generate and address personal letters to each customer. Each customer thinks the cattleman personally types the letter to them. In reality, his microcomputer merged the names into the standard letter stored in the micro. This cattleman argues that this is a very cost effective way to advertise his purebred cattle. The key is the professional printer and the word processing software.

SLIDE 42 -- SUPERBRAIN MICROCOMPUTER

This is a picture of a Superbrain that South Dakota AGNET has. It is a level II microcomputer. Notice that the disk drives are built into the cabinet. This is extremely nice when you move the microcomputer around.

SLIDE 43 -- HULLETT PACKARD 85

This is the Hewlett Packard 85. Since this picture was taken, HP announced the HP-125 as their small business machine. HP long has a reputation of producing high quality products and we believe this is also true for their microcomputers. To date, I am not aware of any agricultural software available for the HP machines.

SLIDES 44 & 45 -- INSIDES OF A CROMENCO COMPUTER

This is a picture of the insides of a Cromenco microcomputer. Notice the cage (called S-100 buss) and how the board slide into the cage. Notice also that there is room for several additional boards to meet your expanding needs. This micro is configured to be a fairly powerful microcomputer, yet there are several empty slots for future additions. Level II machines are considerably more flexible than the level I machines. This common S-100 buss allows board manufacturers to build one board that will fit several different kinds of machine. This is a real advantage to having a S-100 buss microcomputer.

SLIDE 46 -- LEVEL II HARDWARE

The more common level II microcomputer that farmers are considering are: Northstar, Vector Graphics, Superbrain, Hewlett Packard, and Cromenco. There are also other brands but they tend to be less popular.

SLIDE 47 -- CHARACTERISTICS OF LEVEL II MICROCOMPUTERS

There are several differences in the level II micros as compared to the level I micros. The key differences are: basic language compilers that are faster than level I interpreters, 80 character screens which make visicalc and communications easier to use, more standard operating systems such as CP/M (this means it is easier to exchange programs from one machine to another), more error diagnostics for software and hardware, and the S-100 buss (for more hardware exchangeability).

SLIDE 48 -- DATA CASSETTE

In the past, we used cassettes for data and program storage. In fact, you can use your kids' cassettes and their tape recorder on your micro to record data and programs. While this is a very cheap storage device, by today's standards it is too slow and inflexible.

SLIDE 49 -- FLOPPY DISK

The technology that has made microcomputers of value to agriculture is the floppy disk--a phonograph record with a paper covering around it. Instead of recording music on the disk, the micro records data and computer instructions on the disk. The floppy disk now provides the microcomputer with mass storage capability. Dr. Schoonover can store data for 500 cows on one of these disks. If you have 1,000 cows, you simply use two disks. In fact, you can have as many of these disks as you want on the shelf. You just pull off the shelf the disk that you want and put it into your micro.

SLIDE 50 -- HARD DISK FOR MICROCOMPUTER

The newest storage technology is the hard disk (pictured on the left). Inside this little box is the ability to store 5 million characters of data. You could store all the management information that you would ever need or generate on your farm or ranch on this one hard disk. Most farmers or ranchers do not have this kind of data storage needs. The purebred cattleman that I have mentioned before has a hard disk on his Vector Graphics machine. He keeps all his pedigree information for his cow herd on the hard disk. In fact, he can go back to 1932 with his pedigree searches. He feels that the microcomputer has helped his purebred business out considerably.

SLIDE 51 -- TEACHING CENTER

This is a Radio Shack Teaching Center. It has 15 microcomputers hooked up to a sixteenth computer. The sixteenth computer can monitor the other 15 computers. Wyoming's agricultural Extension service needs one of these to bring 15 ranchers or farmers in for training. I sure wish that I could take 15 of you and set you down to a training center like this! I am sure that I could help you learn more about microcomputers than my just showing you slides. While you may say that having these kinds of teaching centers is wishful thinking, did you know that many high schools and vocational technical schools have similar setups? It's university extension services that are behind.

SLIDE 52 -- COMPUTERS FOR FARM AND RANCH

Let's now boil this all down--what does it mean for you on the farm or ranch.

SLIDE 53 -- MEETING THE CHALLENGES OF THE 80'S

Agriculture is going to have some serious challenges in the 80's. While during the 60's and 70's your challenge was production, the challenge in the 80's is going to be financial management. The fact that you are at this conference tells me that you recognize this and that you are looking for ways to improve your financial management.

Yes, the computer does offer some potential for some of you. Let me make a prediction. Those of you that will be farming in 1990 will be using computers. Those of you that do not want to use a computer will not be farming in 1990. Many farmers and ranchers do not want to use computers. I often hear, "No damm computer is going to tell me how to farm!" I predict that person won't be farming in 1990. Many will have retired and others will have gone out of business. Computers are going to become commonplace on U.S. farms and ranches during the 80's.

SLIBE 54 -- PRODUCER OWNED COMPUTERS

As I travel around the country talking to farmers and ranchers, I hear them expressing interest in three applications of the microcomputer. The three applications are:

1. Business Accounting
2. Herd performance reporting
3. Financial management.

Top producers are recognizing that they need to keep better books. They are looking to the microcomputer as a means to making bookkeeping easier and more flexible. They want current cashflow situations several times during the year. Today's profit margins do not allow the management errors that you could get by with in the 70's.

Top ranchers know the benefits of good cow-calf records and they have been keeping them on the 3- by 5-inch cards; however, it takes a lot of time to sort them into useful management reports. A herd performance system fits well onto a microcomputer and once the data is in the computer, management reports can easily be printed out. We even know of one rancher that takes his micro right out to the scales and enters the calf weights as they are weighed. When the last calf is weighed, he pushes the button and identifies the cows to be immediately culled. He says this saves considerable time by not having to round up the cows again when he has the culling data available. He argues that the cost savings of rounding up cattle the second time will pay for his microcomputer.

Bankers are requiring more and more financial information before they will make loans to producers. Top producers are starting to see the potential of being able to use the microcomputer to help generate these needed reports. Financial Statement, Profit and Loss Statements, cash flow projections, five-year plans, etc., can all be generated with the aid of a microcomputer.

SLIDE 55 -- VISICALC - A FINANCIAL MANAGEMENT TOOL

One of the most powerful financial management tools available is VISICALC. It is designed so that you don't have to be a programmer to program your own financial management programs. There is nothing equivalent on AGNET! Since I don't know how to describe in words what VISICALC can do, we will just have to demonstrate it to you during the demonstration period. If you don't see our demonstration, stop into a computer store and ask for a VISICALC demonstration.

SLIDE 56 -- DISK ORIENTED SYSTEM

In order to have sufficient capacity to handle your agricultural applications, producers should buy a disk-oriented system. It should contain:

1. dual disk drives
2. a good 80-column printer
3. 32K to 48K memory (the horsepower of the computer)
4. 80-column screen (preferred over a 40-column screen)
5. telephone coupler

The system will cost between $4,000 to $5,000 for the hardware and I would expect that you will spend $2,000 to $3,000 for programs (software) for your farm or ranch.

SLIDE 57 -- TELEPHONE COUPLER

One of the extremely useful attachments that you can purchase for your microcomputer is a telephone coupler. This will allow you to use your micro as a terminal to large mainframe computers such as AGNET, TELPLAN and CMN. You can call the mainframe on the telephone and type in your information on your micro's keyboard and have the output printed out on your micro's printer. The cost of a phone coupler is around $300.

SLIDE 58 -- APPLE TELEPHONE COUPLER

The black box in the lower left hand corner is a picture of one kind of telephone coupler for an Apple computer. Notice that one of the cords is plugged directly into the telephone outlet box. The other cord is plugged into a board in the Apple computer. With this black box, you can then call other computers--even other Apple computers. You can use this to call your university computer, AGNET, the DHIA computer, and your local cooperative's computer. A telephone coupler opens up all kinds of opportunities for you to access agricultural information. A telephone coupler is a must for any producer-owned system.

SLIDE 59 -- INFORMATION NETWORKING ON AGNET

For example, if you have a telephone coupler on your micro you can access:

1. current commodity market prices.
2. current USDA, Foreign Ag and Wyoming news releases.
3. Agricultural outlook and situation reports.
4. Western Livestock Market Information Project livestock analyses.
5. Hay for sale.
6. Sheep for sale.
7. Certified pesticide applicators in Wyoming.
8. People interested in judging county and state fairs.
9. Horticultural tips during the summer.
10. Home canning tips during the canning season.
11. Emergency information such as drought tips, Mount St. Helen's emergencies, etc.

You can even use your micro to access the UPI and AP news services available. Wouldn't it have been interesting to have been able to search for any news stories dealing with the "Farm Bill" during recent months? Or search for the news stories about "beef." The AP and UPI news services are available from two commercial time-share companies. You can do all this today with your micro if it has a telephone coupler on it.

SLIDE 60 -- MARKET INFORMATION ON AGNET

We are putting around 17 different daily market price files on AGNET, including the futures opening and closing prices. We have Chicago, Kansas City and Minneapolis futures going onto AGNET. In addition, we have both national and selected local cash markets going onto AGNET. We are reporting local feeder cattle sales in Wyoming, Northeastern Colorado, and Western Nebraska. Local grain and cattle markets are being put on weekly for Nebraska. Feedlot reports for the major cattle feeding states are going periodically. Export data is also going on weekly. AGNET is becoming a major source of market information for agricultural producers. This appears to be the major reason for most of our producer subscriptions to AGNET. They want current market information.

SLIDE 61 -- HOW TO BUY A SMALL COMPUTER

What should a farmer and rancher do if he is thinking about buying a small computer?

SLIDE 62 -- FARM COMPUTER NEWSLETTERS

There are two newsletters that I recommend that you subscribe to on computers in agriculture. Successful Farming is now publishing the newsletter shown in this slide. I believe the subscription rate is $40.00 per year. They evaluate hardware and agricultural software and I find these evaluations very useful.

The second newsletter is published by Doane-Western Agricultural Service out of St. Louis, Missouri. Their subscription rate is $48.00 per year. Both of these newsletters are excellent sources of information about microcomputers. If you are seriously considering a microcomputer, I strongly recommend that you subscribe to one or both of these newsletters.

SLIDE 63 -- HOME COMPUTERS FOR FARM USE

The second thing I recommend that you do if you are considering purchasing a computer is attend one of the computer seminars that are being held around the country. Almost every state extension service is holding these seminars specifically for farmers and ranchers interested in learning more about microcomputers and the potential agricultural applications. Contact your local county extension agent or extension advisor for information on these seminars.

SLIDE 64 -- SUMMARY

In Wyoming we are using the AGNET system to provide Wyoming farmers and ranchers with their first contact with computers for:

1. Record keeping such as beef herd performance.
2. Problem solving for computer aided decision making.
3. Information networking such as daily market information.
4. Electronic mail to speed up the delivery of research and extension information to clientele.

Computerized Management Aids (CMA's) are not new to agriculture. They are just new to the west. Leading Midwest farmers have been using CMA's for over 10 years.

Microcomputers are the new farm and ranch management tools and innovative producers are buying them. More and more farmers and ranchers are going to own one or more microcomputers.

If you buy a microcomputer, be sure and buy the telephone coupler so that you can access the agricultural information networks being set up across the country. You will need to spend around $4,000 to $5,000 for a microcomputer with enough horsepower and flexibility to do your farm or ranch applications. If you will only spend less, maybe a microcomputer is not for you. I do assure you, however, that we are going to see considerably more farm and ranch purchases in the next five years.

APPENDIX I

Listing of Programs Available to AGNET Subscribers

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   AA     GGGG   N    N  EEEEEE   TTTTT
  A  A   G    G  NN   N  E          T
 A    A  G       N N  N  EEE        T
 AAAAAA  G   GG  N  N N  E          T
 A    A  G    G  N   NN  E          T
 A    A   GGGG   N    N  EEEEEE     T

PPPPP   RRRRR    OOOO    GGGG   RRRRR     AA    M    M   SSSS
P    P  R    R  O    O  G    G  R    R   A  A   MM  MM  S    S
PPPPP   RRRRR   O    O  G       RRRRR   A    A  M MM M    S
P       R  R    O    O  G   GG  R  R    AAAAAA  M    M      S
P       R   R   O    O  G    G  R   R   A    A  M    M  S    S
P       R    R   OOOO    GGGG   R    R  A    A  M    M   SSSS

                        IIIII  N    N
                          I    NN   N
                          I    N N  N
                          I    N  N N
                          I    N   NN
                        IIIII  N    N

        DDDD    EEEEEE  TTTTT    AA    IIIII  L
        D   D   E         T     A  A     I    L
        D    D  EEE       T    A    A    I    L
        D    D  E         T    AAAAAA    I    L
        D   D   E         T    A    A    I    L
        DDDD    EEEEEE    T    A    A  IIIII  LLLLLL
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CONTENTS

TABLE 1: SELECTED LIVESTOCK PRODUCTION MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
BEEF GROWER	Grows beef cattle from an initial weight to some final weight given environmental temperatures, feedlot conditions and ration specifications. Frame size, nutritional background, sex and compensatory growth are all taken into account.
BEEF FEEDER	Predicts the performance of specific feedlot cattle under different environmental temperatures.
FEEDMIX	Designed to formulate "Least-Cost Balanced Rations." Major objective is to find what combination of your feed will meet the animal's nutrient requirements at the lowest cost. You can also use "Ration Check" to analyze your existing ration. BEEF - primarily for feedlot operations RANGE - primarily for beef cows and calf wintering operations DAIRY - for dairy rations SWINE - for swine rations POULTRY - for poultry operations
SWINE FEEDER	Predicts how the performance of swine at a given weight (lbs) is affected by environmental temperature.
SWINE GROWER	Will grow swine from an initial weight to some final weight given environmental temperatures.
COWGAME	Simulates the selection process in beef herds. Demonstrates the genetic principles which affect the rate and amount of response to certain common selection factors in beef cattle. You are given an initial herd of 50 cows and you have to make mating decisions based on performance information provided. Teaches how to use beef performance programs in selecting cattle.
BHPP/BHAP	Beef Herd Performance Program and Beef Herd Analysis Program. Used to generate, store, and analyze individual ranchers' beef herds. Designed for commercial cow herds rather than purebred operations.
WEAN/YEARLING	Beef herd performance programs for purebred operations.
RANGERATION	Simple, fast and effective ration balancer for beef cows, wintering calves, horses, and sheep. Basically a computerized "Pearson Square".
VITAMINCHECK	Check vitamin and/or trace mineral additions to a swine diet. Compares what's in a given diet to the nutrient requirements of swine.

TABLE 2: SELECTED AG ENGINEERING MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
TRACTORSELECT	Once a power level has been selected, this model helps a user determine the suitability of a specific tractor to his farming or ranching enterprise. Nebraska tractor test data is stored in the data base.
CONFINEMENT	Determines the ventilation requirements and heater size for a swine house given its usage, capacity, dimensions, R values, ventilation rates and the inside and outside design temperatures.
PUMP	Provides a suggested bill of materials needed to install an irrigation system. System components are identified along with suggested life and cost. Can compare several different irrigation systems with one another or can evaluate performance of an existing system.
HOUSE	Estimates the heat loss and costs of heating and cooling a house given location, inside design temperatures, dimensions and size and specifications of walls, doors, windows, roof, ceiling and foundation. Uses stored weather data bases.
BINDRY	Predicts the results of most natural air and low temperature corn drying systems with the drying occurring in the bin. Program uses actual weather data for selected locations.
DRY	Grain drying simulators for (1) crossflow, (2) concurrent, (3) counterflow, and (4) natural air type driers.
FANSIZE	Estimates fan size requirements (static pressure losses, total CFM and horsepower) to deliver air at prespecified airflow rate through a specified grain for a given duct bin system.
FANMATCH	Matches a fan's performance characteristics (as presented by advertised CFM vs S.P. rating) to a system (bin, duct, and grain type) and generates a table specifying the fan's performance at various grain depths.
DUCTLOCATION	Determines the number, size and location of aeration ducts to properly aerate grain in a flat storage building. Full round or flush mount ducts can be selected.
STOREGRAIN	Calculates the costs and break-even prices for on-farm vs. commercial grain storage for periods up to 36 months. The storage costs presented are broken down showing interest charges, shrinkage amounts, property taxes, etc. Up to 6 storage periods can be considered simultaneously.
GRAINDRILL	Calculates the lowest cost width for a grain drill for your farm. You can then check its ability to cover your acres on time and also check its power requirements against your tractor's capacity.

TABLE 3: SELECTED CROP PRODUCTION MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
IRRIGATE	Aids in monitoring crop water use and in scheduling irrigations. Predicts crop water use for 12 days into the future and determines the next date to start the irrigation system. Uses two methods to predict water use: (1) min-max temperatures and soil moisture blocks or (2) min-max temperatures, wind run, solar radiation, and dew point temperature data.
HAYLIST	Allows hay producers to list hay supplies, pasture and/or stalks for sale. Program designed so that buyers can find out who in their community, county or region has these items for sale.
BESTCROP	Provides an equal return yield and price analysis between two or more cropping alternatives based on expected yield, price and direct cash expenses.
SOILSPROGRAMS	A series of 16 programs geared to Nebraska's teaching, research, and extension soils program. Programs vary from student review exams, performing multiple regressions on certain types of fertilizer experiments to providing fertilizer recommendations on the basis of user selected soil test data.
RANGECONDITIONS	Calculates the range condition and carrying capacity of native range. Retrieves information on the classification of various range plants stored in the data file. Present data base is for Western Nebraska.
SOIL LOSS	Estimates the computed soil-loss (tons/acre/year). Designed for cropland east of the Rocky Mountains.
FLEXCROP	Forecasts yields based on amount of water available for crop growth. Base yield is adjusted for variety selection, fertilizer application, weed control, rotation, and planting date. Current crops are wheat, barley, oats, and safflowers, data base geared to Montana.
SEEDLIST	Provides seed producers a way to list supplies of seeds for sale. Sellers can easily update the listings as part of the seed is sold and they can delete the listing when all seed stocks have been sold. Buyers can scan county by county for particular variety.

TABLE 4: SELECTED HOME ECONOMIC MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
DIETCHECK	Performs a check on your nutritional intake for a specified time period compared to required daily allowances stored in the computer.
DIETSUMMARY	Provides a group summary analysis of the individual DIETCHECK runs made for a specific group of people.
FOODPRESERVE	Compares the costs of home canning of fruits and vegetables versus buying canned goods at the store.
BEEFBUY EXBEEFBUY	Analyzes: (1) the amount of packaged meat in a live steer, side or quarter of beef, (2) the cost of meat actually put in a freezer, and (3) the cost of various methods of purchasing beef. EXBEEFBUY runs a sample of BEEFBUY.
PATTERN	Helps a seamstress select a commercial pattern size and type most suited to her figure.
STAINS	Makes recommendations for stain removal methods given fabric type, stain, etc.
FIREWOOD	Analyzes the cost efficiency of heating with wood versus traditional heating fuels.
MONEYCHECK	Helps families look at their family financial budgets. Compares their specific budget to typical budgets for families of same characteristics.
BUSPAK	
LOAN	Calculates loan payments given loan amount, length of loan, interest rate and number of payments per year.
EQUITY	Calculates loan payments and prints out a repayment schedule for your specified loan.

TABLE 5: SELECTED 4-H AND YOUTH MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
CIS	Designed to provide high school age youth with an opportunity to explore alternative career choices and to learn about the training required, where training can be obtained, what the potential salaries are, etc. Youth can quickly broaden their understanding of potential careers that match up to their interests.
SCORE	Provides computer assistance to record keeping and scoring of 4-H judging contests. Has been modified to fit Wyoming's Vo Ag and Community College judging contests. Allows judging coaches to retrieve detailed member analysis class by class. (Designed by Wyoming).
FAIR	Tabulates and scores judging contests. Tabulates placings, questions, reasons, and other classes that you want to set up. Output results for individuals or by division (juniors and seniors). Uses mark sense input. (Designed by Nebraska).
CARCASS	Used to analyze and tabulate beef or lamb carcass judging contests. The model calculates cutability, yield grade, and index from eight input items. Results can be ranked by any desired output column.
PREMIUM	Compiles and summarizes county fair premium data. You are able to enter a descriptive title for each lot and class. Program calculates premium amount for each contestant even if receiving premium money from several classes.
JUDGELIST	Lists people available to serve as judges for county fairs, by areas qualified. County may add names as well as list those already on file.
COWGAME	Simulates genetic selection in beef herd. Several teams may "compete" over time. See Table 1.

TABLE 6: SELECTED FARM AND RANCH PLANNING MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
CALFWINTER EXCALFWINTER	Provides an estimate of production and marketing costs associated with wintering calves. Allows user to also include costs of additional capital investments needed to be able to winter calves. EXCALFWINTER runs a sample of CALFWINTER.
GRASSFAT	Provides an estimate of production and marketing costs associated with pasturing yearling calves during the summer. Costs of additional capital purchases needed are also taken into account.
COWCOST	Provides an estimate of production and marketing costs and returns associated with a beef cow-calf enterprise. Variable costs plus straight line depreciation on new and existing capital improvements are calculated and printed out.
EWECOST	Estimates production and marketing costs associated with a sheep enterprise. Variable costs plus straight line depreciation on new and existing capital improvements are calculated.
DAIRYCOST	Analyzes the monthly costs and returns associated with a dairy enterprise. Cost information is presented on a per-hundred-weight of milk produced. Home grown feeds produced on the farm are charged at the current market price.
LSBUDGETS	Designed to print out stored livestock budgets. Program allows quick input changes so user can easily customize the budget to a specific situation.
MACHINEPAK	A package of machinery related programs.
MACHINE	Used to estimate field machinery costs. Can be used to estimate custom rate, compare costs between machines or estimates a lease rate using fixed costs only. Can also be used to estimate costs of different field operations.
CUSTOM	Uses results from "MACHINE" program to calculate: (1) breakeven acreage for purchasing a machine and (2) calculates a custom rate to charge for field work performed.
GRAINDRILL	Calculates the least cost width for a grain drill for your farm. Allows you to check the drill's ability to cover your acres on time and to check power requirements against your tractor's capacity.
FIXEDCOST	Estimates fixed costs as a percent of purchase price for farm machinery and equipment. Resulting percentages can then be entered into the "MACHINE" program.
SEMITRUCK	Estimates the current costs of operating a tractor-trailer rig. Both variable and fixed costs are considered in the model.

TABLE 6: SELECTED FARM AND RANCH PLANNING MODELS ON AGNET (continued)

MODEL NAME	DESCRIPTION OF MODEL
LANDPAK	Package of programs to assist in land management decisions.
BUYLAND	Estimates the maximum bid price per acre that you can afford to bid for land. Takes land appreciation and tax benefits into account. Projects your cash flow requirements if you pay the maximum bid price.
CASHRENT	Calculates what you can afford to pay for rent given your production costs and economic outlook.
MINCOME	Calculates the minimum net cash income required to pay the loan payments and income taxes per acre of land purchased. User enters his land bid price and the program determines the net cash income needed per acre to pay for it.
BUSPAK	A package of financial analysis programs made available by the Business School. Many apply also to agriculture. For example: depreciation, loan, and equity.
DEP	Calculates depreciation for any specified asset. You pick the depreciation method.
DEP3	Calculates the annual depreciation charges for a new or used piece of equipment. Lets you compare three methods of depreciation for new assets and two methods for used assets.
LOAN	Calculates the payments required to meet the specifications of a loan. You can solve for different unknowns by providing the other numbers.
EQUITY	Prints out a repayment schedule for a user specified loan.
PLANPAK	A package of 7 programs designed to help farmers and ranchers analyze and plan the financial and production aspects of their farm or ranch business.
FARMPLAN	Provides a computerized budgeting procedure for comparing the physical and financial characteristics of your present farm or ranch organization with alternative farm and ranch organizations. It permits the user to size up future profitability, debt servicing ability, and solvency characteristics of your present farm or ranching operation.
PLANTAX	Calculates your potential Federal income taxes based on the information you enter on current income and expenses. You can easily consider the tax outcomes of alternative tax management strategies to minimize your Federal Income Tax payments.

TABLE 6: SELECTED FARM AND RANCH PLANNING MODELS ON AGNET (continued)

MODEL NAME	DESCRIPTION OF MODEL
CROPBUDGET	Calculates and prints out crop budgets. Analyzes the operational cost of the machinery inputted and any custom operations the user uses in producing the crop. Program outputs a list of the operations done to produce the crop.
CROPBUD	Prints out selected Wyoming crop budgets published by the Ag. Economics Division. Internal data files serve as the starting point. Users are allowed to change input items to their specific circumstances so output can be customized to their specific situation.

TABLE 7: SELECTED INFORMATION NETWORKING MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
MARKETS	Disseminates weekly and daily commodity prices to all AGNET users. Selected files are updated with futures markets put on twice a day. There are 18-20 different market files being maintained on AGNET.
NEWSRELEASE	Designed for rapid dissemination of newsworthy information dealing with the broad scope of agriculture and home economics information. Information items are divided into categories such as consumer, foods, crops, energy, safety, situation and outlook, management, youth, other.
GUIDES	Similar to NEWSRELEASE but files are of more long-term interest, such as drought, horticulture, and other tips.
HAYLIST	Designed to identify and locate who has hay for sale, pasture to rent, or stalks for sale. Seller can categorize his feed for sale or rent by type, harvesting method, county, and city. Sellers can add in specific comments to better describe their products for sale.
EWESALE	Designed to identify and locate usable sheep for sale. Allows seller to add his specific comments including price (optional) to categorize his sheep.
MAILBOX	Used to send and receive messages and electronic mail to/from other AGNET users. Selected mailing lists are already stored in the computer so the user has to type the message only once and the computer will automatically duplicate it for all addresses in the mailing list. A "Hotline" mailing list is available for regional or national emergencies.
NEWS	Provides AGNET users with latest AGNET system notifications about programs and user related information.
WHO IS	Retrieves a name and company affiliation of individual users on the AGNET system.
HELP	Prints out 15 different instruction sets that make up the AGNET users manual, including current list of general and specialized AGNET programs.
WYOPROGS	A list of the specialized Wyoming programs available only to Wyoming users.

TABLE 8: SELECTED MARKET PRICE RETRIEVALS, PLOT AND FORECASTING MODELS ON AGNET

MODEL NAME	DESCRIPTION OF MODEL
MARKETS	Prints current market price data for a variety of commodities and market locations. Commentary files from marketing specialists around the country are also available. Files include livestock and grain futures and cash prices, hay reports, feedlot and terminal markets.
PRICEPLOT	Retrieves future prices that are put on the computer by the Wyoming Department of Agriculture, Cheyenne. User selects the contract month and is given the option to plot either the daily prices or the 3-day moving average.
CASHPLOT	Retrieves and plots selected beef cash prices. Data base used is commodity page, Wall Street Journal. Total year plots can be done daily or every X number of market days.
PRICEDATA	Prints cash and futures prices and/or basis for selected commodities reported in MARKETS program.
MARKETCHART	Prints moving average bar, or point-and-figure graphs for futures contracts of selected commodities. A useful tool in planning market strategies and determining price trends.
CAPRINT3	Prints out table of national cash prices for 12 selected commodities. Prints out every other market day's prices for 60 market days (almost 3 calendar months).
CATTLE	Calculates the feeder cattle (steers) market prices for alternative weights of cattle based on the latest data from Eastern Colorado markets. Can be used to either retrieve recent feeder cattle prices or can be used to project any future contract price over different animal weights.
BEEFADVISORY	Presents specific advisory information and guide to assist feedlot managers in their replacement decisions. Attempts to guide cattle feeders in maximizing expected profits for a year or less planning period (training in interpretation of output required).
SWINEADVISORY	Presents specific advisory information and guide to assist swine production managers in making feeding decisions. Attempts to guide swine producers in maximizing expected profits for a year or less planning period. (training in interpretation of output required).

TABLE 8: SELECTED MARKET PRICE RETRIEVALS, PLOT AND FORECASTING MODELS ON AGNET (continued)

MODEL NAME	DESCRIPTION OF MODEL
CORNPROJECTION	Projects the average U.S. corn price for various corn marketing years. Program employs the traditional balance sheet approach used by marketing and outlook specialists.

TABLE 9: GENERAL AGNET PROGRMAS

GENERAL AGNET PROGRAMS - LAST UPDATE 11/11/81

PROGRAM NAME	DESCRIPTION
BASIS	Develops historical "basis" patterns for certain crops
BEEF	Simulation and economic analysis of feeder's performance
BEEFADVISORY	Beef feedlot placement and sales advisory report
BEEFBUY	Comparison of alternative methods of purchasing beef
BESTCROP	Provides equal return yield & price analysis between crops
BINDRY	Predicts results of natural air & low temp. corn drying
BROILER	Simulation and economic analysis of broiler's performance
BUSPAK	Package of financial analysis programs
ANNUITY	Solves problems involving periodic payments
BUDGET	Capital budgeting
CAPITAL	Cost of capital
CASHFLOW	Discounted cash flow
DEP	Depreciation
DEP3	Depreciation (3 methods solved simultaneously)
EQUITY	Loan equity
FUTVAL	Future value
GROWTH	Rate of growth in equity
IRR	Internal rate of return
LOAN	Single loan
LUMPSUM	One-time investment
MULTLOAN	Multiple loan
NETDEP	Net declining balance depreciation
RETURN	Return on investment
CALFWINTER	Analyzes costs and returns associated with wintering calves
CARCASS	Scoring & tabulation of beef or lamb carcass judging contest
CARCOST	Calculates costs of owning & operating a car or light truck
CASHPLOT	Prints a plot of selected cash prices
CONFERENCE	A continuing dialogue among users on a specfic topic
CONFINEMENT	Ventilation requirements & heater size for swine confinement
CORNPROJECT	Projects ave U.S. corn price for various marketing years
COWCOST	Examines the costs and returns for beef cow-calf enterprise
COWGAME	Beef genetic selection simulation game
CROPBUDGET	Analyzes the costs of producing a crop
CROSSBREED	Evaluates beef crossbreeding systems & breed combinations
DAIRYCOST	Analyzes the monthly costs and returns with milk production
DIETCHECK	Food intake analysis
DIETSUMMARY	Summary of analysis saved from DIETCHECK
DRY	Simulation of grain drying systems
DUCTLOCATION	Determines ducts to aerate grain in flat storage bldg
ECON	Package of teaching programs dealing with economic concepts
EDPAK	Demo programs illustrating computer assisted instruction
EWECOST	Analyzes the costs & returns of sheep production enterprise
EWESALE	Lists sheep for sale
FAIR	Scoring and tabulation of judging contests
FAN	Determination of fan size and power needed for grain drying
FEEDMIX	Least cost feed rations for beef,dairy,sheep,swine,& poultry
FILLEDIT	Constructs and modifies files for use in FILLIN
FILLIN	A "fill in the blank" quiz routine
FIREWOOD	Economic analysis of alternatives available with wood heat
FOODPRESERVE	Calculates costs of preserving foods at home
FUELALCOHOL	Estimates production costs of ethanol in small-scale plants

TABLE 9: GENERAL AGNET PROGRAMS (continued)

GAMES	Package of game programs
GRASSFAT	Analyze costs and returns associated with pasturing calves
GUIDES	Prints available reports of reference material information
HAYLIST	Lists hay for sale
HELP	Lists available programs & items of interest to general user
HOUSE	Estimates the costs of heating and cooling a house
INPUTFORMS	Prints available input forms
IRRIGATE	Irrigation scheduling
JOBSEARCH	Matches abilities and interests to occupations
LANDPAK	Package of programs to assist in land management decisions
BUYLAND	Estimates maximum price you can afford to pay for land
CASHRENT	Estimates maximum cash rent you can afford to pay for land
MINCOME	Calculates minimum net cash income required to make payments
MACHINEPAK	Machinery analysis package
CUSTOM	Calculates breakeven acreage and custom rates
FIXEDCOST	Estimates machinery costs as a percent of new purchase price
GRAINDRILL	Least-cost grain drill analysis
MACHINE	Determination of field machine costs
SEMITRUCK	Estimates cost of operating a tractor-trailor rig
MAILBOX	Used to send and receive mail
MARKETCHART	Prints bar, moving ave., or point & figure charts on futures
MARKETS	Various market reports and specialists' comments
MC	A multiple choice quiz routine
MCEDIT	Constructs and modifies files for use in MC
MICROPROGRAM	Lists programs for microcomputers
MONEYCHECK	Financial budgeting comparison for families
NEWSRELEASE	A program for rapid dissemination of news stories
PIPESIZE	Computes most cost-effective size irrigation pipe to install
PLANTAX	Income tax planning/management program
PREMIUM	Compiles and summarizes fair premiums
PRICEDATA	Prints selected historic cash and/or futures prices
PRICEPLOT	Designed to plot market prices in graphic form
PUMP	Determination of irrigation costs
RANCHADVISORY	Ranch (cow-calf) marketing advisory report
RANGECOND	Calculates the range condition and carrying capacity
SEEDLIST	Lists seed stocks for sale
SOILSALT	Diagnosis salinity & sodicity hazard for crop production
SOYBEANPROD	Demonstration soybean production management model
SPRINKLER	Examines feasiblity of installing sprinkler irrigation
STAINS	Tells how to remove certain stains from fabrics
STATPAK	Package of programs for statistical analysis of data
STOREGRAIN	Cost analysis of on farm and commercial grain storage
SWINE	Simulation and economic analysis of feeder's performance
SWINEADVISORY	Feeder pig and slaughter hog marketing advisory report
TESTPLOT	Standard analysis of variance
TRACTORSELECT	Assists in determining suitability of tractors to enterprise
TREE	Summarization of community forestry inventory
TURKEY	Simulation and economic analysis of turkey's performance
VITAMINCHECK	Checks the level of vitamins & trace minerals in swine diet
WEAN	Performance testing of weaning weight calves
YEARLING	Performance testing of yearling weight calves

TABLE 10: SPECIALIZED AGNET PROGRAMS

SPECIALIZED AGNET PROGRAMS - LAST UPDATE 4/9/81

PROGRAMS WHICH ARE AVAILABLE TO THE GENERAL PUBLIC, BUT ARE DESIGNED TO BE USED WITH ADDITIONAL MATERIALS AND/OR TRAINING FROM PROGRAM AUTHOR(S).

PROGRAM NAME	DESCRIPTION
AFFORD	Financial budgeting model
AGBUS	Agribusiness management game
ANIMAL	Analysis of gain & feed consumption of experimental trials
BIGMGT	Big management farm supply game
BUDGEDIT	Builds and modifies files for use in BUDGET
BUDGET	General accounting & bookkeeping system
BULLTEST	Used for Nebraska bulltesting program
FARMSUPPLY	Farm supply business management game
FEEDEDIT	Used for building and editing files for the FEEDMIX program
GRADINGPRO	Package of programs used in grading exams and quizes
INSECTCONT	Insect control teaching programs
LIFESTYLE	Lifestyle assessment
LP	Linear programming model
LPEDIT	Used for building and editing files for the LP program
MARKOV	Markov chain analysis - simulating trends of growth of systems
MBO2	Simulation of meat quality in merchandising
PCA	Management decision model for Production Credit Associations
PLANPAK	Package of programs for financial analysis and planning
SOILSPROGRAMS	Package of programs dealing with soil problems and analysis
SORTANIMAL	Random sorting & assignment of animals to pens in experiments
SUPERMARKET	Supermarket business management game
TRANS	Transportation model for allocation between supply and demand
WILDLIFE	Pgms simulating enviromental effects on undomesticated animals

Each of these programs can be executed by typing the program name.

APPENDIX II

"Six Steps to Take In Making A Decision

to Buy a Computer"

Managing By Computer: Is This Tool For You?

Six Steps To Take In Making A Decision To Buy A Computer

By Harlan Hughes
University of Wyoming

Micro-computers represent a relatively new agricultural management tool.

One study indicates that as high as 64 percent of the producers interviewed were planning on buying a micro-computer as a management tool in the next five years. Twenty-seven percent indicated they would purchase a micro-computer in one to two years.

These producers ranked business record keeping as the number one management function they wanted to perform on the micro-computer. The preparation of financial balance sheets, income and cash flow statements ranked second. Breakeven analysis of individual enterprises and crop production records ranked as the third and fourth management functions, respectively, these producers wanted to do on their micro-computers.

In Alberta, Canada, a study of producers presently owning micro-computers indicated they were using them for: 1. Farm planning. 2. Financial record keeping. 3. Physical record keeping. 4. Analysis of records (cash flow, breakeven analysis, and costs of production).

What level of computers do producers own? Sixty percent of the Canadian producers owned Radio Shack and the rest owned Apple, Pet Commodore, Vector Graphics and other machines. A Doane's Agricultural Service study indicates 48 percent of the producers owning micro-computers had Radio Shack, 23 percent owned Apple and the remaining 32 percent owned Commodore, Vector Graphics, and others.

These studies indicate that micro-computers can be an effective management tool; however, a producer-owned micro-computer must pass the same cost/benefit analysis as any other machinery investment. Costs can be easily identified and documented; however, the benefit of improved management is considerably more difficult to document. What is clear, however, is that benefits received depend heavily on the preparation that the cattleman does before purchasing the micro-computer.

A recent farm magazine survey ranked record keeping as the number one function desired to run on the micro-computer. Tax management and marketing information tied for second and third place.

The first step in getting ready to purchase a micro-computer is to study your management information needs. Collection and analysis of management information requires time and money. You cannot afford to collect management information that you do not use or need.

Some questions that you should ask are: What are the most important and significant decisions that I need to make? What information is needed to make the decisions? Can the generation of the needed information be routinized? Can a micro-computer make this information collection easier? Studying your information requires some time and effort. It may well be worth your time to hire a consultant or visit with your university extension service and get a second opinion.

Harlan Hughes

The second step in getting ready to purchase a micro-computer is to identify what computer programs (software) are available that might meet your management information needs. A cattleman has four potential ways he can obtain his needed software. He can (1) buy it from a commercial vendor, (2) obtain it from his Extension Service, (3) hire it custom programmed, or (4) program it himself.

If the software needed is available from a commercial vendor, this may well prove to be the most satisfactory method of acquiring software. Quite often, however, what a cattleman needs is not available from a commercial vendor. The local Extension Service may have what is needed. Often the only viable alternative is to hire a program custom-programmed or program it yourself. Unless a person has some unique training or a lot of spare time, I cannot recommend that he program it himself. Obtaining software tailored to a cattleman's specific needs will be the most difficult and frustrating task.

Step three is to determine the hardware specifications required to execute the needed software. The size of the business affects the volume of management information needed and this, in turn, determines the size of hardware needed. Micro-computers come in different sizes (memory units), have different storage capabilities on the diskette (floppy disc), and have different add-on capabilities (80 column screens, upper and lower case characters, computer languages, CP/M operating systems, telephone modems, word processing software, etc.).

Again, it is recommended that a consultant or the Extension Service be contacted. Computer dealers are not necessarily the best information sources for determining specific hardware needs. Generally, they promote what they have to sell.

Step four is to contact local hardware dealers and determine what are the viable hardware alternatives. Cattlemen should use the same criteria that they would use for any other equipment purchase — this includes dealer knowledge of his own hardware, quality of the service department, apparent financial stability of the dealer's business, and in general, how you would feel about doing business with the dealer. Since cattlemen have purchased equipment before, they should feel reasonably comfortable with this step.

Step five is to estimate the cost/benefit of the proposed computerized management information system. A dealer can tell you exactly what the hardware will cost. Remember that you can take investment credit and fast depreciation on computer hardware.

By now, a cattleman should have an estimate of what the software will cost. Don't forget to include the clerical cost of collection and processing the management information. This frequently is the wife's or cattleman's time. Collecting and typing data into the computer is time consuming and boring. Cattlemen might even consider hiring a person to be specifically responsible for the data processing of the management information.

Costs of the total management information system can and should be projected. A Michigan State University study indicates that it may cost $500 to $600 a year to process a producer's business records through his own micro-computer. Again, an outside consultant can be useful.

Estimating the dollar benefit of having a computerized management information system is difficult for most cattlemen to do. Today's high costs of production and high interest rates do not leave much margin for management errors. Just preventing one management error a year may well pay for the micro-computer system. The ability to experiment wit[h] decision on paper before implementati[on] may well justify a micro-computer.

The final step is to make the decisi[on] to set up or not to set up a computeriz[ed] management information system. Catt[le]men should consider talking to oth[er] cattlemen that already own micro-co[m]puters. Many states are also offeri[ng] educational seminars for ranchers a[nd] farmers to learn more about h[ow] micro-computers can enhance a pr[o]ducer's decision making process. T[he] final decision rests with you, t[he] individual cattleman. There is no blank[et] recommendation that will fit all situ[a]tions. Micro-computers can, howeve[r] be an effective management tool.

Micro-computers are becoming a mo[re] common management tool for cattleme[n]. Innovative producers are purchasin[g] micro-computers to enhance their pe[r]sonal management information system[.] This article summarizes six recom[m]ended steps that cattlemen should g[o] through in making the decision [to] purchase a micro-computer. If these s[ix] steps are followed, a person will have [a] higher probability of a successful exper[i]ence with his first micro-computer.

Today's low profit margins and hig[h] interest rates will place a premium on [a] cattleman's management informatio[n] system. Purchasing a micro-comput[er] may prove to be one of the few profitab[le] equipment purchases of the 1980's. Certainly, successful cattlemen will b[e] spending more and more time in th[e] 1980's developing and working wit[h] their management information system[.] Automation of a cattleman's manage[ment] information system lends itself to [a] micro-computer.

Editor's note: Harlan Hughes is Agri[culture] Coordinator and Associate Professor in th[e] Division of Agricultural Economics at th[e] University of Wyoming.

Glossary Of Computer Terminology

Abort: The process of stopping a running program in an orderly fashion.

Acoustical coupler: A device for connecting the telephone handset to the computer input port.

Add-on: Hardware that can be added to an existing system to increase capacity performance.

Algorithm: Any step-by-step procedure to make the computer perform a desired task.

Alphanumeric: The set of all alphabetic characters, numeric characters and punctuation characters.

ANSI: American National Standards Institute. This organization sets standards for many aspects of computer technology.

APL: A Programming Language. A high level language for special applications.

Applications software: A program that performs a specific function, such as processing feed yard management data or accounting data.

ASCII: American Standard Code for Information Interchange. Character code used for representing information in most non-IBM equipment.

Back-up copy: A copy of a program o[r] data base preserved in case the original i[s] lost or accidentally made unusable.

Bank: A group of memory chips th[at] operates as a single unit of memory, suc[h] as a 64K memory.

BASIC: (Beginner's All-purpose Sym[bolic] Instruction Code) A simplifie[d] programming language widely used b[y] novices.

Baud: Refers to the speed at whic[h] information is moved from the CPU (central processing unit) to the termin[al] or printer.

Benchmark program: A sample pro

APPENDIX III

"Now That You Have Decided to Buy a Microcomputer --

What's Next?"

by

Ted Nelson

Oklahoma State University

OKLAHOMA STATE UNIVERSITY
Dept. of Agricultural Economcs
Extension Farm Management
Ted R. Nelson
March, 1981

NOW THAT YOU HAVE DECIDED TO BUY A MICRO-COMPUTER--WHAT NEXT?

Before You Buy!

Once you have made it through the agonizing process of deciding that you can no longer get along without having that modern wonder of technology and you have worked out the money problem in your mind it is only human to get right into it and bring home the new "baby". Suppress that urge- for a little while and recheck your goals. "Reset" and decide:

A. What job(s) are really important to you.
B. What software is most important to you and where you will get it and what it will cost.
C. That you will devote several hours a week for several weeks getting familiar with the operation of the machine and the programs.

Once these conditions are resolved, go ahead and get the best deal you can considering the software, service and prices for any of the established brands.

Among the established brands it is my opinion that they all do a good job of running the software designed to run on them: but there are important considerations:

SERVICE- Is the repair procedure satisfactory to you? (Sooner or later it will be needed).

SOFTWARE- Are acceptable programs available at the right price?

Now That You Have a Machine!

1. GET ACQUINTED- With the manual. It is time-consuming, YES, BUT it will save a lot of time later if you really understand the Operating System (Whether you use "canned" programs or do your own.
2. GET SOME PROGRAMS- Be prudent and be sure you will use them before you lay out bigbucks, but you can learn a lot by seeing how some other programmers do things--and they give you something concrete to work with.
3. DIG INTO THOSE PROGRAMS- If they are in BASIC, you can hit BREAK at any time and see what line they are working on; then LIST the surrounding lines and tell what is going on and how it is done. A critical point in all programs is at the "Main Menu". Write down that line# so- when the program breaks with data in it, you will not endure the frustration of loosing all that information by starting the program "from the top". Just type GOTO Ln# and get back to the place where you can try it again.
4. LEARN to EDIT so you can personalize your programs to do it YOUR WAY if you feel the need.
5. RECOGNIZE that some "BlackBox" programs or routines are needed.

Programs- BASIC vs. OTHER-

Acquiring programs is complicated by the wide variety of forms in which programs are available. Several definitions are useful:

INTERPRETIVE Languages are those for which the instructions (Source Code) are changed into machine instructions as the program is executed, BASIC on most micros is an example. The best thing about them is that they are easy to program and to modify using the EDIT features. The machine instructions are never stored, either in memory or on disk, but are used momentarily as they are created when the program is executed.

Advantages= 1. Lower programing cost. 2. Easy to change. 3. Relatively easy to translate between brands. 4. They come with the machine at no extra cost.

Disadvantages= 1. Slow execution and loading. 2. Functions limited to those provided by the dialect of the language used. 3. Difficult to maintain proprietary control.(From the author and vendor's point of view.)

COMPILERS convert source statements to Load Modules for more efficient storage and execution-Examples are FORTRAN(FORmula TRANslator) & COBOL(COmmon Business Oriented Language).

Advantages=1. Five to ten times faster loading and execution. 2. Distribution of load modules rather than source code protects proprietorship.

Disadvantages= 1. Must buy the compiler ($100-Up.) 2. More difficult for user to change.

ASSEMBLERS create very efficient load modules which require minimal space to store and execute very fast with maximum availability of functions possible on the machine.

Advantages= 1. Very fast execution. 2. Protected code.

Disadvantages= 1. Tedious, slow (expensive) to program. 2. Very difficult to modify.

DOS who?

DOS is computereeze for DISK OPERATING SYSTEM. It does for the micro with disk the control functions and additional interpreting and utility functions that the ROM(-Read Only Memory) chip usually does for the system with no disk drives. Machine vendors usually supply a DOS disk with the first disk drive purchased, and it is different for each model. Updated (improved) versions are released from time to time and packed with equipment shipped after the release date.

The version supplied by the vendor is "supported" by the vendor; i.e. It is designed to work with the peripheral equipment (printers,-etc.) sold by that vendor and if serious errors are discovered a free replacement will often be supplied.

Other DOS's such as NEWDOS, VTOS, CP/M, etc. are for sale by various software houses which contain additional or special features- These often have to do with management of disc files, improved source--code editing properties or more convenient communications capabilities.

Some of these are compatable with the original DOS. Others are not because they are created to provide a common operating system for the purpose of transfer of programs between brands and models of computers.(Such as CPM).

Advantages= 1. Compatability of programs between brands and models, allowing multi-brand distribution of programs.

Disadvantages 1. Extra cost ($100 up) for the DOS. 2. Inability of users who do not have it to use programs created for it.

So-- WHAT DO I BUY?

The choices are many, but so are the objectives and sophisication of users, so there is no "pat" answer to what fits where without examining the specific application. That's part of management!

APPENDIX IV

"Interfacing Farmer-Owned Computers to Extension Computer Systems Like AGNET"

INTERFACING FARMER-OWNED COMPUTERS TO EXTENSION COMPUTER SYSTEM LIKE AGNET

by

Harlan Hughes and Karen Holman[1/]

MICROCOMPUTERS

Microcomputers are the latest electronic devices to come on the scene. These are often called "home computers" or "small business computers." A microcomputer is a low-priced stand-alone computer priced from $500 up to $10,000. Microcomputers will impact on extension in both county agents' offices and directly on farmers and ranchers. Let's take a look at both of these applications.

Microcomputers in County Extension Offices

Utah State University is presently piloting the use of Apple microcomputers in county extension offices. According to Larry Bond, they plan to use the micro to maintain 4-H enrollment records, mailing lists, budgets, Semis reports, etc. In addition, Larry is designing and collecting a library of management decision aids for the Apple microcomputer. Recently, I attended the Rocky Mountain Section of the Society of Agricultural Engineers meeting in Laramie, Wyoming. Utah State Agricultural Engineers reported on two irrigation applications that they have put on the Apple. One dealt with projecting water requirements for lawns in Salt Lake City and the other dealt with projecting water needs of agricultural crops. I assure you that Wyoming is looking to Utah to learn how the microcomputer fits into the day to day activity of a county extension office.

Microcomputers on Farms and Ranches

Wyoming farmers and ranchers are starting to show some interest in owning microcomputers. The College of Agriculture is receiving inquiries from farmers and ranchers about microcomputers. Wyoming held a mini-conference on microcomputers in May, 1980.

There are three farm and ranch applications that may justify a Wyoming rancher owning his own microcomputer. The applications are:

(1) Business accounting,
(2) Herd performance,
(3) Financial management.

Let's look at each of these applications individually.

I recently had the opportunity to attend a Nebraska conference on farm computers and to talk to several Nebraska farmers that owned their own microcomputers. It soon became evident that the present cost-price squeeze was the motivating force for farmers owning their own microcomputer. They were using the micro to keep their accounting books current. Some argued that they needed their cash flow positions current at all times. Their microcomputer's accounting system made that process easier.

Many ranchers realize that a microcomputer can easily provide them with more and better herd management reports. A microcomputer will permit the herd master file to be more easily updated. Once the data is in the computer, the computer can quickly sort and print out several useful management reports. With a microcomputer, the herd management reports can be generated before the manager has to make the herd management decisions.

More and more bankers are requiring financial statements, operating statements, and cash flow projections from ranchers and farmers. The cost price squeeze is also increasing farmers' and ranchers' interest in knowing where their operation is financially. Financial statements, operating statements and cash flow projections can be developed

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[1/] Harlan Hughes is AGNET Coordinator and Karen Holman is AGNET Programmer, University of Wyoming, Laramie, Wyoming. Paper presented at conference on "Computer Applications to the Beef Cattle Industry," Wichita, Kansas, May 27, 1981.

with a microcomputer. Once developed, they can be more easily updated with the microcomputer. This will permit a rancher to know exactly where he is financially before he makes major financial decisions for his business.

HARDWARE NEEDS FOR A PRODUCER-OWNED HOME COMPUTER

A business accounting system, a herd performance system, and a financial management package are going to require a disk oriented microcomputer system. A dual disk system will be necessary so that back-up copies of disk files can be made. A good printer is also needed for output reports and certainly is needed for audit trails. A cassette recorder is often nice to have when you get outside software. Some software is now being transferred by disks but cassettes are still common. The processing requirements of the home computer system will require at least 32K to 48K bytes of memory (where K=1000).

A rancher or farmer should plan on spending at least $4,000 to $5,000 for a 32K or larger system with dual floppy disks and a good printer. While this is considerably more than the $500 microcomputer advertised on TV, this is about what it will take to do what a farmer or rancher will want their home computer to do. It does not take much of a management improvement to make $4,000 to $5,000 difference in profit today.

INTERFACING PRODUCER-OWNED HOME COMPUTERS WITH AGNET

Microcomputers can be equipped with a telephone coupler that can be used as an AGNET terminal. With this $300 attachment, the producer-owned micro can be used to call up the 200 plus programs in the AGNET library.

When producers purchase the option to use their microcomputer as a terminal into AGNET, they have the best of two worlds:

(1) They can use their micro for stand-alone processing of routine business accounting, herd performance, and financial management, and

(2) They can also access the centralized libraries of Computerized Management Aids in AGNET on as frequent or infrequent basis as desired.

ACCESSING THE AGRICULTURAL INFORMATION NETWORK WITH A PRODUCER-OWNED HOME COMPUTER

Ranchers are expressing considerable interest in the "AGRICULTURAL INFORMATION NETWORK" now available on AGNET. Wyoming is using the AGNET mainframe computer as an electronic filing cabinet for a large amount of agricultural information. Users are provided with an up-to-date menu of the information filed in the computer and they can choose what information they want to see.

Ranchers and farmers can now use their microcomputer to:

(1) Retrieve today's market prices. They can also retrieve past prices for comparison. South Dakota State University and the University of Nebraska marketing specialists are providing producers with a weekly analysis of cattle and grain price trends and what is causing the trends.

(2) Obtain current outlook reports and interpretations from market analysts around the country. Bob Price, Western Livestock Market Information Project in Denver, puts on outlook and analysis information that should be of considerable interest to Wyoming producers.

(3) List his hay for sale, sheep for sale, or pasture for rent. If he wants to buy hay, sheep or rent pasture, he can check who has listed these items for sale.

(4) Review current and timely news releases available on agriculture, consumer economics, and home economics. USDA as well as Ohio are putting on current information of value to Wyoming producers.

(5) Producers can send electronic mail directly to his county extension office. Written recommendations can be electronically sent to the producer from his local county extension office or state office.

(6) Transmit range (drought) conditions to county, state and regional offices (Western Livestock Market Information Project office in Denver). Information can rapidly flow from producer to county to campus as well as from campus to county to producer.

COMMUNICATION LINKAGES TO AGNET

The Wyoming AGNET staff is presently working out procedures for interfacing microcomputers to the AGNET system. The AGNET computer appears to be one of the harder mainframe computers to link to. As of to date, Wyoming AGNET has made this linkage with a Pet Commodore model 2001, and the newer CBM system, Radio Shack model II, and an Apple II Plus. As resources become available, AGNET Wyoming will continue to develop communication interfaces with other brands of microcomputers.

Microcomputer users are cautioned that frequently standard microcomputer hardware and vendor supplied software will not interface with AGNET. You are strongly encouraged to actually make the interface before paying for your equipment and software. Good intentions from your equipment dealer do not help much if your equipment will not interface. I can quote you several cases where the microcomputer owner is quite frustrated to find out his microcomputer is not configured to interface with AGNET.

We believe that the secret to having a successful interface is based on (1) how you configure your system and (2) on what software you are trying to use. For example, ASCII Express seems to work for most Apple II configurations. ASCII Express can be purchased from any Apple dealer for around $65. Without ASCII Express we know of certain Apple II configurations that will not interface with AGNET.

In summary, we advise people to test and actually do the interfacing before you pay for your equipment. Plan on purchasing some software to facilitate the interfacing.

Give us a call at 307-766-2107 and we will be glad to share with you what we have learned about interfacing microcomputers to AGNET. If we don't know the answer (and the odds are we won't), we'll be glad to work with you. That's how we learn. As we work with individuals we are building up some expertise so that eventually we will have a databank of answers to the interfacing challenges. AGNET Wyoming is convinced that interfacing microcomputers into mainframe computers is the wave of the future. This kind of distributive processing system is certainly the direction agricultural computers will go.

APPENDIX V

"Microcomputer Magazines Sample List"[1/]

1/ Source: Arlin J. Brannstrom, "Microcomputers in Farm Management", paper presented at American Society of Farm Managers and Rural Appraisers Annual meeting, Louisville, Kentucky, November 5, 1981, page 9.

MICROCOMPUTER MAGAZINES SAMPLE LIST

The following is a partial list of representative microcomputer magazines. Those interested in learning more about microcomputers are encouraged to read as much as possible.

BYTE. Published by BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458. BYTE is one of the oldest and most widely read microcomputer magazines. Each issue contains several hundred pages of advertising for various software packages, and hardware components. Some articles may be too technical for the beginner, but this is a magazine which is definitely worth looking at.

Creative Computing. Published by Creative Computing, P. O. Box 789-M, Morristown, NJ 07960. Creative Computing tends to target the personal computer market. Separate columns are included for owners of Apples, TRS80's and Commodore Pets.

Interactive Computing. Published every other month by Association of Computer Users, Inc., P. O. Box 9003, Boulder, Colorado 80301. It contains benchmark reports for many microcomputer systems.

Interface Age. Published by McPheters, Wolfe & Jones, 16704 Marquardt Ave., Cerritos, CA 90701. Interface Age is geared more toward the small business microcomputer user. It features benchmark reports for various microcomputer systems and evaluations of business software packages.

Kilobaud Microcomputing. Published by Wayne Green, Inc., 80 Pine St., Peterborough, NH 03458. Microcomputing is another excellent magazine. Features tend to vary from small business to hobby to education.

MICROSYSTEMS. Published by Creative Computing, 39 East Hanover Ave., Morris Plains, NJ 07950. This is a bi-monthly publication which focuses on the CP/M, S-100 microcomputer.

onComputing. Published by onComputing, Inc., 70 Main St., Peterborough, NH 03458. onComputing is a magazine geared for the first-time user. I particularly recommend an article by Larry Press called Getting Started in Personal Computing in the Spring 1981 issue.

APPENDIX VI

"Glossary"

Source: A. J. Brannstrom, "Microcomputers in Farm Management", paper presented at American Society of Farm Managers and Rural Appraisers Annual meeting, Louisville, Kentucky, November 5, 1981, pages 10-12.

GLOSSARY

Applications Software: A program (or group of programs) that performs a specific business function, such as accounting or payroll.

ASCII: (American Standard Code for Information Interchange) A common standard for representing numbers and characters inside a computer.

Assembly language: A low-level language used where high speed and small program size are important.

Basic: (Beginner's All-purpose Symbolic Instruction Code) A relatively easy-to-use language that comes with many small computer systems.

Batch Processing: Programs and data are stored in files and processed all together in a "batch."

Baud Rate: The speed at which information is exchanged over communication lines. Usually baud rates are ten times the number of characters per second transmitted.

Binary: The basis for calculations in all computers, this two digit number system consists of digits 0 and 1 which are represented in the computer's processor as the presence or absense of a small electrical pulse.

Bit: The smallest unit of information that the computer recognizes. A bit is equivalent to the presence or absence of an electrical pulse.

Bug: An error in a computer program.

Byte: A group of bits (usually 8). A byte is used to represent one character (number or letter) of information.

Chip: A thin silicon wafer on which electronic components are deposited in the form of integrated circuits.

COBOL: (COmmon Business-Oriented Language) A high-level programming language widely used in business applications on large computers.

Computer Program: A collection of instructions that together instruct the computer to perform a desired task.

Compiler: A special program that converts a programming language into code the computer processor can read.

CP/M: A general purpose operating system, developed by Digital Research Corp., that has now become a standard for many microcomputers.

CPU: (Central Processing Unit) The part of the computer that controls the interpretation and execution of the processing instructions.

CRT: (Cathode Ray Tube) A television-like screen which may be used for viewing data and program instructions.

Data: The raw information within a computer system.

Data Base: A collection of interrelated data that is organized for ease of update and retrieval. For example, a livestock data base would include the health and breeding information for a herd of animals.

Density: A term used to describe the distance between magnetic information on tapes or floppy disks. The higher the density, the more information storage capability.

Disk: A revolving plate upon which data and programs are stored.

Downtime: The period during which a computer is not operating because of a machine failure.

File: A collection of related records; a ledger for example.

Editor: A utility program that allows a user to enter and manipulate data files.

FORTRAN: (FORmula TRANslation) A high level language widely used for scientific and engineering problems.

Hardware: The physical components of a computer system.

Input: The data that is entered into the computer; the act of entering data into a computer.

Interface: The juncture at which two computer components meet and interact with each other.

K: Computer shorthand for the quantity 1024; the term is usually used to measure computer memory capacity.

Machine Language: A program - consisting of a string of 1's and 0's - that the computer can understand directly.

Memory: The section of the computer where instructions and data are stored.

Menu: A list of alternative actions displayed on the CRT for selection by the user.

Microcomputer: A small computer in which the CPU is an integrated circuit deposited on a silicon chip.

Modem: (MOdulator-DEModulator) A device to allow computer signals to be sent and received over telephone lines.

Operating System: A series of programs generally provided by the computer manufacturer to perform the computer's basic functions such as reading the input from the keyboard, or copying one disk to another.

Output: The information printed by the computer.

Peripheral: A device attached to a computer (for example, the CRT or printer).

Printer: A peripheral device to record computer output on paper. Three major types of printers exist for microcomputers: thermal printers, character printers, and dot matrix printers.

Program: A set of coded instructions directing a computer to perform a particular function.

Programming Language: A set of words and rules that constitute a language understood by the computer and the programmer alike.

Response Time: The time required for the system to respond to a user's request or to accept user's inputs.

Software: A general term for computer programs and documentation involved in the operation of the computer.

Storage: The portion of the computer devoted to holding information while it is not needed by the CPU.

System: The CPU and all peripherals.

Terminal: A device to communicate with the computer. (Usually through a keyboard and a CRT or on printed paper.)

Throughput: A measure of the amount of work that can be accomplished by the computer during a given period of time.

Timesharing: A method of sharing the resources of the computer between several users. Computers are much faster than the poor humans who operate them. Thus several people can appear to be running different computer tasks simultaneously through a timesharing system.

Turnaround Time: The measure of time between the initiation of a job and its completion by the computer.

Word: A group of bits that the computer stores in one location in memory.

Word Length: The number of bits that can be stored in one memory location.

APPENDIX VII

Communications With Microcomputers

COMMUNICATIONS WITH MICROCOMPUTERS[1/]

by

Harlan Hughes and Robert Price[2/]

Wyoming is now communicating to AGNET with a Pet Commodore and an Apple II Plus on a regular basis as each microcomputer is equipped with a telephone coupler. We simply dial the AGNET computer from the keyboard of the microcomputer. The coupler for the Pet is a TNW488-103 running with a slightly modified PTERM103 software package that collectively cost $540. The coupler for the Apple is a D. C. Hayes and their associated software that collectively cost $300.

Pet

The Pet's PTERM103 software program is a flexible package that allows us to effectively use the Pet as a "dumb terminal" to AGNET. One starts a terminal session by loading the program which we have renamed "AGNET." After loading it you type in RUN and a menu shows up on the screen. The menu is:

ANSWER, CALL, DISPLAY, EXIT, HANG-UP, SET, TEST, USER, CR.

While I will not take time here to explain all of the commands in the menu, there are several command options available. I can call in any of the options by typing in just the first letter of the option name. For example, to call AGNET just type in a "C". Since it also has the AGNET telephone number stored in the PTERM103 software, I can retrieve the AGNET telephone number by typing in "N1." The software takes over and automatically dials the AGNET computer. From this point on the microcomputer is under control of the AGNET computer and operates just like a "dumb" terminal.

The PTERM103 software does allow one to interrupt the AGNET control and return to the PTERM103 menu. This in turn allows the microcomputer user to turn the microcomputer's printer on or off as desired. This is a very useful feature when using a microcomputer as a terminal with AGNET. With the interactive sessions you often only need hard (printed) copy of a portion of your terminal session. By being able to turn the printer on and off, you save a considerable amount of paper.

Apple

The Apple coupler operates in a similar manner. You first invoke the D. C. Hayes by typing in "IN#3", then you command the modem software with the "Control A". "Control H" puts the modem in half duplex as required by AGNET. A "Control A, Control Q" allows you to dial AGNET. Once AGNET answers, you operate your microcomputer just as if it was a dumb terminal.

While it took a while to discover, we are now able to turn the printer on and off during AGNET sessions. You first must get out of the Apple terminal mode by hitting the "Control A, Control R" and return. This puts you in Applesoft mode so that you can turn the printer on by a PR#1. You now get back into Apple terminal mode by hitting "Control A, Control H." You are now printing the output. You can turn the printer off by inserting PR#0 in place of the PR#1. We also find that we cannot use the printer on/off routine on the CDC mainframe computer.

Using the Apple as a Smart Terminal

Microcomputers have the power to do considerably more than operate as a dumb terminal to a mainframe computer. With its logic ability, a microcomputer can operate as a "smart terminal" when connected to a mainframe computer; however, a smart terminal software package is required. The authors are aware of three smart terminal packages for the Apple

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[1/] This is a revised version of an earlier paper written in October, 1981. This paper is as of January 25, 1982.

[2/] Harlan Hughes is AGNET Coordinator, University of Wyoming, and Robert Price is Senior Economist, Western Livestock Market Information Project, Denver, Colorado.

microcomputer. They are:

1. ASCII Express
2. Data Capture
3. Visiterm

ASCII Express

For $60 you can purchase a smart terminal software package for the Apple called ASCII Express. This software package was developed by Southwestern Data Systems. This program stores the name and phone number for up to 18 mainframe computer systems in a menu-driven format. Each system can have a separate set of keyboard macro definitions to help you log on to each specific machine. With just a few key strokes, you can call up and log on to any system.

The ASCII Express is equipped with a buffer that can be used to capture incoming data (downloading) or to send data up to the mainframe (uploading). Any DOS file can be uploaded including Integer BASIC, Applesoft BASIC, text, and binary files. Utility programs are available to help with the uploading and downloading. A fairly powerful edit routine is also part of the package. We find the edit routine very useful.

AGNET Wyoming has ASCII Express and we find it very useful. It had opened up several doors to information networking that we are presently using on AGNET. We are uploading electronic mail, news releases, and market information on a regular basis. We are downloading information from the CMN system and uploading that information to the AGNET computer.

Data Capture

Southeastern Software sells a smart terminal package called Data Capture for $65 (eighty-column versions sell for $90). This program also operates with a buffer that is used for uploading and downloading. It has a unique feature of a buffer status line with a continuous display telling you at a glance how many lines have been captured in the buffer. It will also automatically save the buffer on disk whenever it fills up. AGNET Wyoming does not have the Data Capture Program, but we have used it briefly on someone else's micro as a dumb terminal and it was easy to use. The edit program appears to be very limiting.

Visiterm

Visiterm is a part of the new software series from Personal Software. Visiterm costs $129 but has many innovative features that make it a very flexible smart terminal package. Visiterm allows a wide range of protocols for sending text. Programs can be sent after the usual conversion to text files. Visicalc-generated files can also be send with Visiterm.

AGNET Wyoming has briefly tested this package and found it has one major limitation. We could not print the output while receiving it from the mainframe. We consider this unsatisfactory as a communications package.

Communications With CP/M Operating Systems

WLMIP is now communicating with AGNET using a Vector equipped with the D. C. Hayes micromodem 100 and associated software. The cost for the package is approximately $500.

The Hayes software is invoked by byping "MM100". The commands in the Hayes software are invoked by doing a Control A. This allows you to set duplex to half, make parity settings, dial the computer and other necessary commands.

The standard Hayes package does allow the CP/M microcomputer to operate in the dumb terminal mode with AGNET. However, it does not support features to allow uploading of data files. WLMIP is extensively searching packages that are compatible with the operating system used for AGNET. As of October 1, 1981, no packages had been discovered that would incorporate the uploading features.

The MM100 for CP/M operating systems is equipped with a command invoked by typing a "Q" which allows the user to turn the printer on (Q1) or off (Q0) at any time during the terminal session. There is also a capture buffer that allows you to download information from a mainframe and capture it on a disk file in the microcomputer. This capture buffer can be turned on and off at will during the terminal session. However, it does not automatically write to disk when full but instead empties itself and begins capturing over again at that point.

The author of the MM100 has now provided a revised version that allows us to upload from the Vector Graphics to AGNET and CMN. Instead of checking for the Control Q promptor message sent by AGNET, the software has a one second delay built in. It waits for one second and then sends the next line to AGNET. This works OK for data files, but does not allow the stacking of program instructions. We will continue to work with the author on this.

Information networking is rapidly becoming the wave of the present. Microcomputers equipped with telephone couplers turn a micro into a logical device to access information networks. We estimate that uploading can reduce telephone time by 30-50 percent. The economic incentive to develop some top quality communication packages is very high.

APPENDIX VIII

Using Model II TRS-80 With AGNET

USING MODEL II TRS-80 WITH AGNET

Hardware Needed

1. TRS-80 Model II (64K preferred)
2. TRS-80 Modem I direct connect
3. Telephone with modular jack
4. Telephone line extension to connect to phone line equipped with modular jack.
5. If hardcopy is desired a compatible printer must also be attached to the Model II.

Software Needed

1. AGNET terminal program as written by Mike Anderson, 800 Terminal Building, Lincoln, NE 68505.

Procedure Checklist

Start-Up

1. First, be sure all disk drives are empty. Then turn on the Computer.
2. Turn on the Disk Expansion System (if present) and all other peripherals.
3. Insert a system diskette into the built-in drive (drive 0) and close the drive door. The system will initialize and TRSDOS will start up.
4. Answer DATE and TIME questions.
5. When you see the words TRSPOS READY and a blinking cursor on the display you are ready to call up the AGNET terminal program.
6. Plug in power supply for Modem I.
7. Check on cords and switches on Modem I.
   a. phone line connected
   b. remote phone connected to Modem I
   c. select switch on "NORM"
   d. Mode switch to "OFF"
8. Type AGNET ENTER .
9. "* ERROR CARRIER DETECT GONE * CABLE IN?" will appear on screen.
10. Dial your AGNET phone number through remote phone.
11. When you hear the carrier come on line switch mode switch on Modem I to "ORIG". Hang up the phone.
12. "VM 370 ONLINE" should appear.
13. Normal log on procedures are now followed. You are in a dumb terminal operation.
14. Echol screen to line printer by pressing F1 key on keyboard. Turn printer off by the same procedure.

APPLICATIONS FOR PERSONAL COMPUTERS

Bill Borror
Gerber, California

Computer Programming for Registered Beef

The most often question I am asked about my computer system is, "What kind is it?" The most often question should be, "What are you doing with it?" My remarks today will be emphasizing the latter of these two questions, because it is imperitive for anyone considering a computer system to thoroughly study the tasks that machine is going to perform before purchasing any equipment. Defining those tasks and developing the software, i.e. the instructions the computer needs to accomplish those tasks, are the real challenges in developing a computer system.

Computers are much like cows - you put in certain things - the creature digests them - and you receive something in return. Well, in the case of cows if we do everything right, we'll get something back we can use, we hope at a profit. With the computer if we do everything right, again we'll get something we can use, we hope at a profit. Unfortunately, if we don't do everything right, we'll get back nothing but wasted time and in worst cases, misinformation that may be damaging to our overall efforts. Now this computer isn't any smarter than our cow, it simply has a larger retrievable memory. The big difference is that the cow can't manage a computer but a computer can manage a lot of cows or at least provide us with the information to do a more effective job of managing our cows.

I have several tasks for my computer, but today I'm going to stick pretty much to the record system I've developed for my registered Angus herd, going into some detail into the records I'm keeping as I believe that is the topic of most interest to you. Again, I can't overemphasize the point that it isn't the machine that really matters, it is the writing of the software, all the decisions that have to be made regarding inputs, outputs, and how the machine is going to be told what to do with them that is our biggest challenge.

Let's set up some criteria for what this system is to accomplish.

1. I want to be able to operate it, i.e. get the information in and out without any technical computer experience. Most farmers and ranchers will not be hiring professional operators to run the equipment, therefore this system must be easy to use.

2. The system should be designed so that all input information is entered one time and one time only. I'm sure we are all aware from our long experience in keeping records by hand that every time data is copied or transferred, errors crop up that cause us much inconvenience.

3. I want to be able to sort and select records at my discretion. The computer is a speed demon at this task. How about a list of our cows that haven't calved by a certain date in their particular calving season? How about a list of cows that have taken more than 2 breedings per conception during their lifetime? How about a list of cows with Maternal Breeding Values above 100 sorted in order of that MBVR? How about a list of heifers in the current calf crop listed in order of MBVR or the bulls in order of Yearling Breeding Value Ratios? We can just let our imagination run wild - and I dare say it will for you if you get to working with a good flexible system - as to the possibilities available in the way of management information that can be put to good use. I want my system to be flexible, i.e. I want to be able to set up the sort/select modes at my discretion. I don't want to be running 30 miles to a programmer when I think of some new way I want the records presented.

4. There are going to be some mathematical computations made so we want to have that capability. I am doing calculations for expected calving date, gestation length, 205 adjusted weight, adjusted yearling weight, and others I'll go into when I analyze the reports.

5. I like to use preprinted forms for field use. Many years ago when our California Beef Cattle Improvement Association was processing records, I learned the benefit of using preprinted listings for entering field data. Have you ever misread a tattoo or I.D. when weighing calves, turned the calves out, and then realized there was one calf with two weights or some such mixup? Reduction in errors is a real benefit in using computer records and preprinted data forms are a real help in eliminating entry errors.

6. The reports and forms must be in a usable format. I have designed most of my reports on 8½ x 11 18# paper so they will fit in standard notebooks or hard cover binders that won't get demolished when used in the field.

7. I want to be able to fill out breed association registration and weight forms with my system. While my system will have the capability of processing weight records, I'm still going to be recording weights with my breed association so that my data will become part of the national data bank.

8. Most important, I want the reports available when I want to use them. The American Angus Association has a good track record on turn around time in processing records. However, living on the West coast, I'm seeing longer and longer delays in the mail system. I guess it boils down to the fact I can stand waiting on my own efficiencies, but have a difficult time waiting on someone else's.

Let's get down to the nitty gritty and take a look at some of the forms and reports I am generating.

1. Breeding Data Form
2. Breeding Report
3. Calving Order Report
4. Calving Form
5. Dam Calving Report
6. Calf Sire Summary
7. Wean Data Form
8. Wean Sire Summary
9. Wean Selection Report
10. Yearling Data Form
11. Yearling Sire Summary
12. Yearling Selection Report
13. Yearling Data Report
14. Sire of Dam Report
15. Dam Progeny Report
16. Cow Main Record
17. Calf Main Record
18. A.H.I.R. Form

The listings titled "Form" are used for entering data, those titled "Report" and "Summary" are used for analyzing processed data. As I go through each of these forms and reports I am in hopes you will pay more attention to the makeup of the report rather than the actual data presented. Some of the data is good data but some of it isn't. Perhaps if there are questions as I go along, they could be asked while the particular report is on the screen.

1. Breeding Data Form - A listing of all the cows to be bred in a particular breeding season in order of cow I.D. I have listed the sire and dam of each cow and her corresponding breeding values. These values are used in making mating decisions -- more about that later. Then I have a blank for the bull I will assign to each cow and then a space for the date of actual breeding. I might say I breed all cows A.I. so that is the basis of our breeding records.

2. Breeding Data Form - Merely a printout of the breeding data information that is stored in computer memory. I like to enter the breeding data in the machine at 21 day intervals during the breeding season and running this report after each entry session. One can tell at a glance pretty easily whether the breeding operation is being successful.

3. Calving Order Report - After the completion of the breeding season, I process this report to calculate an expected calving date. The cows are listed in order of expected calving date. I put this with the next form so that at calving time I can merely cross off the cows that have calved and then can tell at a glance any overdue cows that might require special attention.

4. Calving Form - A listing of all cows of the particular calving season by cow I.D. with the recorded expected calf's sire and expected calving date with blanks for the information collected at calving time -- Calf I.D., Date of Birth, Sex, Sire, Birth Weight, Comments. I've purposely asked for sire information again just to double check that our expected calving date is within proper parameters. If it isn't, we can check our original breeding data form for possible errors and take appropriate action.

5. Dam Calving Report - A listing by cow I.D. listing all the calving information stored in memory supplied by the Calving Form with the addition of a calving ease score and a calculated gestation length. This report is very useful when wanting to know the data of the calf of any particular cow without having to thumb through pages of calf data to find it.

6. Calf Sire Summary - The same information listed on the Dam report except this report is sorted by sex within sire groups and averages calculated for birth weight and gestation length.

7. Wean Data Form - A form listing all the calves for collection of weaning data -- management code, weight, birth code, comment. I list them in calf I.D. order sorted by sex as I normally weigh the bull-heifer calves in different groups. Here again, by using a preprinted listing, we can catch any entry errors that might have been made at calving time.

8. Wean Sire Summary - Birth and Weaning data sorted by sex within sire groups and averages calculated. This is essentially the same information we'll be getting from the breed association. I have not tackled the problem of calculating breeding values, so I am plugging them into the system from breed association reports.

9. Wean Selection Report - A listing of all weaned calves in order of descending 205-day adjusted weight sorted by sex. One note - all field forms will put a notation in the heading for the season and year of birth and the date the calves were weighed.

10. Yearling Data Form - A form used for collecting yearling data - listed in Calf I.D. order sorted by sex and showing the birth and weaning data already collected.

11. Yearling Sire Summary - Another listing similar to breed association reports showing calves listed in calf I.D. order sorted by sex within sire groups. Again, we are showing all birth and weaning data in addition to the new yearling information.

12. Yearling Selection Report - A report listing calves sorted by sex in descending order of 365-day adjusted weight.

13. Yearling Data Report - This is the final report of a particular calf crop. It is a listing of all calves in order of calf I.D. This is a permanent office copy showing all information on each calf.

14. Sire of Dam Report - The information on a calf crop is sorted by sire of dam and averaged for each of the sires represented. This can be done for a single calf crop or for all progeny of the current cow herd. One can go down through this report and get a pretty good feeling for what bull or bulls are putting the high producing females in the herd.

15. Dam Progeny Report - A listing of all cows in the herd showing the records of their progeny. I am listing birth weight, calving ease, birth code, 205 ratio, 365 ratio, all BVR's, and gestation length. I can run this report at any time after any new information is added to the calf file.

16. Cow Main Record - This is a look at the information being recorded on each individual cow. All of the identification data and her performance records are transferred electronically from the calf file at the time the decision is made to put the heifer into the cow herd. The progeny ratio information and calving and breeding information at the bottom of the record is updated electronically after each calving. These cow records can be called up on the computer screen one at a time, can be edited, or printed out on hard copy.

17. Calf Main Record - The recorded information on each calf. This record can be called up individually for observation, editing, or printing.

18. A.H.I.R. Form - The form supplied by the American Angus Association for recording calf information for registration purposes and weight data. All the necessary information for completing these forms is stored in computer memory so a program was written to fill in the desired information.

The 18 reports I have listed are the ones proven useful to me so far. I would like to emphasize the "so far". It seems as long as there is an imagination at work, there are always new things to be looking into. I doubt if anyone has even scratched the surface as to what can really be done with these micro-computers for cattle management, breeding decisions, or keeping and analyzing our other farm records for maximum returns. The mechanical technology is here for us to use. I challenge B.I.F. and the various breed associations to work towards making maximum use of that technology.

BREEDING DATA FORM

COW#	SIRE	DAM#	WBVR	YBVR	MBVR	BULL#	DATE	BULL
73			0	0	0	______	__/__	______
A197	ERIC	569	109	110	0	______	__/__	______
B356	K40	251	96	98	0	______	__/__	______
B492	B12	499	92	0	0	______	__/__	______
C651	ERIC	796	0	0	0	______	__/__	______
C683	ERIC	417	104	0	0	______	__/__	______
C722	B12	464	104	105	0	______	__/__	______
C726	ERIC	473	103	0	0	______	__/__	______
C748	OSJ	468	102	0	0	______	__/__	______
C796	107	A165	95	0	0	______	__/__	______

BREEDING DATA FORM

COW#	BULL1	DATE	BULL2	DATE	BULL3	DATE
423	VIK	11/29/81	BIK	12/17/81	______	__/__/__
797	183	11/24/81	______	__/__/__	______	__/__/__
777	183	11/29/81	______	__/__/__	______	__/__/__
812	183	12/17/81	______	__/__/__	______	__/__/__
838	VIK	11/17/81	207	12/20/81	______	__/__/__
A116	155	11/20/81	155	12/11/81	______	__/__/__
A128	207	11/25/81	207	12/04/81	______	__/__/__
A127	174	11/26/81	207	12/18/81	207	01/08/82
A248	155	12/03/81	______	__/__/__	______	__/__/__
B407	155	11/24/81	______	__/__/__	______	__/__/__

CALVING ORDER

COW#	SIRE	EXCLFDATE
D020	155	8/25/82
C681	183	8/26/82
C834	174	8/26/82
C725	207	8/27/82
797	183	8/29/82
B407	155	8/29/82
B496	183	9/ 2/82
D031	155	9/ 2/82
777	183	9/ 3/82
B476	155	9/ 6/82

CALVING FORM

COW#	SIRE	EXCLFDATE	CLFID	DOB	SEX	SIRE	BW
423	VIK	9/21/82	____	__/__/__	___	____	____
797	183	8/29/82	____	__/__/__	___	____	____
777	183	9/ 3/82	____	__/__/__	___	____	____
812	183	9/21/82	____	__/__/__	___	____	____
838	207	9/24/82	____	__/__/__	___	____	____
A116	155	9/15/82	____	__/__/__	___	____	____
A128	207	9/ 8/82	____	__/__/__	___	____	____
A127	207	10/13/82	____	__/__/__	___	____	____
A248	155	9/ 7/82	____	__/__/__	___	____	____
B407	155	8/29/82	____	__/__/__	___	____	____

DAM CALVING REPORT

DAMID	CLFID	SEX	SIRE	DOB	BW	CE	GEST	COMMENT
569	L129	C	105	09/03/80	70	1	270	________
572	L167	C	174	09/08/80	88	1	281	________
581	L125	B	005	09/03/80	90	1	284	________
777	L185	C	SSN	09/13/80	72	1	280	________
A115	L157	C	SSN	09/07/80	77	1	276	________
A116	L149	B	005	09/06/80	73	1	281	________
A128	L222	C	174	09/19/80	83	1	284	________
A172	L190	C	105	09/14/80	68	1	276	________
B407	L032	B	105	08/25/80	75	1	277	________
B476	L091	C	005	08/31/80	74	1	277	________

CALF SIRE SUMMARY

CALFID	SEX	DAMID	SIRE	DOB	BW	CE	GEST	BC	COMMENT
L017	B	F821	005	08/20/80	85	1	275		
L019	B	E411	005	08/21/80	75	1	273		
L021	B	C687	005	08/21/80	50	1	274		
L026	B	G207	005	08/21/80	86	1	275		
L043	B	C686	005	08/26/80	86	1	279		
L061	B	H520	005	08/28/80	80	1	273		
L110	B	G313	005	09/02/80	72	1	283		
L125	B	581	005	09/03/80	90	1	284		
L149	B	A116	005	09/06/80	73	1	281		
L188	B	G271	005	09/13/80	80	1	283		
Averages for B of 005					77		278		
A022	C	G164	005	08/21/80	65	1	271		
L028	C	D931	005	08/23/80	67	1	276		

WEAN DATA REPORT

CALFID	SEX	DAMID	SIRE	DOB	BW	WMGT	WWT	BC	COMMENT
L017	B	F821	005	08/20/80	85				
L019	B	E411	005	08/21/80	75				
L021	B	C687	005	08/21/80	50				
L026	B	G207	005	08/21/80	86				
L031	B	D031	SSN	08/24/80	96				
L032	B	B407	105	08/25/80	75				
L043	B	C686	005	08/26/80	86				
L061	B	H520	005	08/28/80	80				
L069	B	F832	SSN	08/29/80	100				
L097	B	G227	174	09/01/80	90				

WEAN SIRE SUMMARY

CALF#	SEX	DOB	SIRE	DAM#	BW	GES	CE	WWT	205	MGT	RTO	COMMENT
L017	B	08/20/80	005	F821	85	275	1	619	536	1	103	
L019	B	08/21/80	005	E411	75	273	1	643	554	1	106	
L021	B	08/21/80	005	C687	50	274	1	577	496	1	95	
L026	B	08/21/80	005	G207	86	275	1	588	524	1	100	
L043	B	08/26/80	005	G686	86	279	1	657	580	1	111	
L061	B	08/28/80	005	H520	80	273	1	547	509	1	97	
L110	B	09/02/80	005	G313	72	283	1	555	511	1	98	
L125	B	09/03/80	005	581	90	284	1	623	578	1	111	
L149	B	09/06/80	005	A116	73	281	1	548	374	1	90	
L188	B	09/13/80	005	G271	80	283	1	565	545	1	104	
Averages for B of 005					77	278		592	520		101	
L022	C	08/21/80	005	G164	65	271	1	540	476	1	114	

WEAN SELECTION REPORT

CLFID	SEX	DAMID	SIRE	DOB	BW	205W	205R
L195	C	E311	SSN	09/15/80	100	495	119
L186	C	E354	SSN	09/13/80	78	491	118
L222	C	A128	174	09/19/80	83	490	117
L198	C	F738	SSN	09/15/80	75	489	117
L139	C	H735	005	09/04/80	74	488	117
L059	C	H631	174	08/28/80	88	483	116
L213	C	H600	105	09/17/80	77	481	115
L167	C	572	174	09/08/80	88	474	114
L068	C	C725	005	08/29/80	72	475	114
L022	C	G164	005	08/21/80	65	476	114

YEARLING DATA FORM Date Weighed: / /

CALFID	SEX	DAMID	SIRE	DOB	BW	205W	205R	WWT	YWT	YMGT
L017	B	F821	005	08/20/80	85	536	104	619	___	___
L019	B	E411	005	08/21/80	75	554	106	643	___	___
L021	B	C687	005	08/21/80	50	496	95	577	___	___
L026	B	G207	005	08/21/80	86	524	100	588	___	___
L031	B	D031	SSN	08/24/80	96	521	100	592	___	___
L032	B	B407	105	08/25/80	75	511	98	581	___	___
L043	B	C686	005	08/26/80	86	580	111	657	___	___
L061	B	H520	005	08/28/80	80	509	97	547	___	___
L069	B	F832	SSN	08/29/80	100	547	105	610	___	___
L097	B	G227	174	09/01/80	90	578	111	627	___	___

YEARLING SIRE SUMMARY

CLFID	SEX	DOB	SIRE	DAMID	BW	205W	205R	365W	365R
L017	B	08/20/80	005	F821	85	536	103	1146	106
L019	B	08/21/80	005	E411	75	554	106	1112	103
L021	B	08/21/80	005	C687	50	496	95	1105	103
L026	B	08/21/80	005	G207	86	524	100	1097	101
L043	B	08/26/80	005	C686	86	580	111	1209	112
L061	B	08/28/80	005	H520	80	509	97	1032	95
L110	B	09/02/80	005	G313	72	511	98	1028	95
L125	B	09/03/80	005	581	90	578	111	1215	112
L149	B	09/06/80	005	A116	73	374	90	605	88
L188	B	09/13/80	005	G271	80	545	104	1110	103
Averages for B of 005					77	520	101	1065	101
L022	C	08/21/80	005	G164	65	476	114	693	101

YEARLING SELECTION

CALFID	SEX	DOB	BW	DAMID	SIRE	205W	205R	365W	365R
L059	C	08/28/80	88	H631	174	483	116	829	120
L213	C	09/17/80	77	H600	105	481	115	778	113
L195	C	09/15/80	100	E311	SSN	495	119	776	113
L167	C	09/08/80	88	572	174	474	114	780	113
L222	C	09/19/80	83	A128	174	490	117	771	112
L152	C	09/06/80	88	H577	174	465	111	767	111
L120	C	09/03/80	77	D167	SSN	467	112	769	111
L068	C	08/29/80	72	C725	005	475	114	765	111
L186	C	09/13/80	78	E354	SSN	491	118	757	110
L111	C	09/02/80	69	H572	005	431	103	748	109

YEARLING DATA REPORT

CLFID	SEX	DAMID	SIRE	DOB	BW	205W	205R	WBVR	365W	365R	YBVR
L017	B	F821	005	08/20/80	85	536	103	103	1146	106	103
L019	B	E411	005	08/21/80	75	554	106	100	1112	103	101
L021	B	C687	005	08/21/80	50	496	95	98	1105	103	102
L026	B	G207	005	08/21/80	86	524	100	97	1097	101	101
L031	B	D031	SSN	08/24/80	96	521	100	101	1010	94	103
L032	B	B407	104	08/25/80	75	511	98	101	1096	102	102
L043	B	C686	005	08/26/80	86	580	111	102	1209	112	107
L061	B	H520	005	08/28/80	80	509	97	97	1032	95	99
L069	B	F832	SSN	08/29/80	100	547	105	106	1094	102	103
L097	B	G227	174	09/01/80	90	578	111	105	1164	108	107

SIRE OF DAM REPORT FALL 1980 CALVES

CALF#	SEX	DAM#	SIRE	205R	365R	WBVR	YBVR	MBVR	DAM'S SIRE
L198	C	F738	SSN	117	107	104	105	104	R178
L256	B	F716	TIT	116	115	107	109	101	R178
Count for R178 is 2				Averages follow:					
				117	111	106	107	103	
L155	B	G373	105	117	120	104	111	103	R330
L236	C	G126	174	95	92	101	99	98	R330
Count for R330 is 2				Averages follow:					
				106	106	103	105	101	
L199	C	E397	KING	102	94	102	98	99	R72

DAM PROGENY REPORT

DAMID	CLFID	SEX	SIRE	DOB	BW	CE	BC	205R	365R	WBVR	YBVR	MBVR	GEST
E511	G331	B	366	10/09/76	0			91	0	0	0	0	0
E511	H741	B	450	11/02/77	75			95	0	0	0	0	0
E511	J213	B	STAR	10/09/78	90			104	0	102	0	0	0
E511	K569	C	F31	09/12/79	90			107	110	105	107	0	0
E511	L166	B	SSN	09/08/80	70		1	102	103	101	104	104	284
Averages for E511					65			99	42	61	42	20	56
F567	L735	B	104	03/14/80	82		1	99	89	100	97	98	0
Averages for F567					82			99	89	100	97	98	0

COW MAIN RECORD

COW ID. . . .D179   DAM ID. . .123   SIRE ID. . .R149
REG#. 7894563
NAME. . . . .Theama Pratissia D179

AGE	DATE	WEIGHT	RATIO	BVR	PROGENY RATIOS
BIRTH	9/12/73	70			
WEAN	4/21/74	523		106	
205 DAY		502	115		8/109
YEAR	10/12/74	856		109	
365 DAY		832	115		6/110
MATERNAL				105	
GESTATION					3/284

FIRST CALVING DATE. . . . .10/09/75   GESTATION. . . . . . .284 DAYS
LAST CALVING DATE . . . . .09/12/81   BREEDING COEF. 1.11
EXPECTED CALVING DATE . . .09/10/82   CALVING INTERVAL

COMMENT. . . . . . . .PATHFINDER

CALF MAIN RECORD

CALF ID. . .L017   DAM ID. . .F821   SIRE ID. . . .005
SEX. . . . .B   REG#. . . .98914326   NAME . . .Tehama Emulous 017

AGE	DATE	WEIGHT	MGT CD	RATIO	BVR
BIRTH	08/20/80	85			
WEAN	04/21/81	619	1		103
205 DAY		536		103	
YEAR	09/12/81	1148	1		103
365 DAY		1146		106	
A.D.G.					
MATERNAL					102

CALVING EASE. . .1   SORT OPTION. . . .   GESTATION. . .275 DAYS
COMMENT. . . .

PM 2E

ANGUS HERD IMPROVEMENT RECORD

PRODUCTION MEASURE
CALVING AND WEANING REPORT

	DAM INFORMATION					CALF INFORMATION										CALF WEIGHT DATA							
	TAG NUMBER	REGISTRATION NUMBER	BIRTH DATE MO.	DAY	YR.	SIRE REGISTRATION NUMBER	CALF TAG NUMBER	SEX	LEFT & RIGHT TATTOO	BIRTH DATE MO.	DAY	YR	BIRTH WT	CALVING EASE	BIRTH CODE	DATE WEIGHED MO.	DAY	YR	ACTUAL WEIGHT	MGT CODE	OPTIONAL INFO	COW WT	BREEDER COMMENTS
1	[illegible]	8935645	[illegible]	11	76	9233329	M340	[illegible]	M340	03	[illegible]	[illegible]	[illegible]			[illegible]	29	81	[illegible]	[illegible]			
2	G372	8933960	11	09	76	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
3	H504	9805812	08	27	77	[illegible]	M342	B	M342	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
4	H562	9167540	09	06	77	8724801	M326	[illegible]	M326	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
5	[illegible]	9167576	09	12	77	[illegible]	[illegible]	B	[illegible]	04	[illegible]	[illegible]	[illegible]	1		[illegible]	[illegible]	81	425	1			164
6	H717	9175468	10	11	77	[illegible]	[illegible]	B	[illegible]	04	08	[illegible]	[illegible]	[illegible]		09	29	[illegible]	[illegible]	1			
7	J881	0	06	05	78	[illegible]	M320	B	M320	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
8	J127	0	09	10	78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	81	[illegible]	1		[illegible]	29	[illegible]	[illegible]	[illegible]			
9	[illegible]	7372917	08	23	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
10	73	0		0	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			[illegible]		[illegible]	[illegible]			

Each row also carries: OFFICE USE: — NAME: — REGISTRATION NUMBER — PRODUCE OF A. I. YES ☐ NO ☐ — REQUEST PERFORMANCE REGISTRATION CERTIFICATE ☐ — OFFICE USE

Row 1 NAME: [illegible] MOOSE 340

Row 2 NAME: TEHAMA KING [illegible]

SEX CODE: B - BULL, C - COW, S - STEER

CALVING EASE: 1. NO ASSISTANCE, 2. SOME ASSISTANCE, 3. MECHANICAL ASSISTANCE, 4. CAESAREAN SECTION, 5. ABNORMAL DELIVERY

BIRTH CODE: A COW OPEN, B COW ABORTED, C CALF DEAD (24 HRS.), D CALF DEAD (PRE WEAN), E CALF SOLD

MANAGEMENT CODE - WEANING (205 DAY): 1. NON CREEP FED (A.B.C. etc.) 3. CREEP FED (A.B.C. etc.)

COMPUTERS IN THE FUTURE

C. R. Benson
Extension Animal Scientist
University of California, Davis

This afternoon my objective is to discuss future applications of computer technology in the beef industry. Harlan Hughes has just discussed some recent developments in computer systems and hardware that have put computers within reach of many ranchers. My perspective will be based on (1) the tasks we want the computer to do (e.g. performance records and business accounting) and (2) how cattle producers will access computer technology.

We are all aware of the mushrooming interest in personal computers. This past January, the interest in California was demonstrated when over 900 farmers and ranchers attended a two day seminar about computers in agriculture. People are interested in microcomputers because they are priced right; they are reliable, and they are available. A microcomputer can give a cattleman access and control over his data and it will enable him to produce reports that are of a special interest to him.

However, a few problems exist. Some people are simply intimidated by computers. Also the expanding interest in computers is creating a software shortage. Software, as some of you may know, are instructions which tell the computer what you want it to do. One aspect of the problem is a shortage of programmers. Another factor is a communication gap between programmers and users. Most programmers do not understand the biological or business situation for which the programs are written and most users are unfamiliar with programming. Additional problems result if a producer has an inconsistent record system which has not been carefully thought through.

"User friendly" software is being developed because most users are not computer specialists. This means that the programs are menu driven with prompts or questions which direct the user. The user friendly concept enables non-programmers - e.g. most farmers and ranchers - to use a personal computer or a computer network without the help of a computer specialist.

However, there is a cost. A user friendly program is more time consuming to write and it requires more of the computer's memory to operate. Memory space in a computer is just like money - we never have enough of it.

It is my impression that the computer industry sees a big market in agriculture. However, they are reluctant to aggressively develop agricultural software because there seems to be a lack of uniformity for program requirements from one ranch to another. Therefore, it is more difficult to recoupe development cost and turn a profit than for other software applications. I think software companies are looking to the Land Grant Schools and agricultural industries themselves for guidance in program development. The Beef Improvement Federation can be a catalyst and provide important leadership in this area.

ACCESS TO COMPUTER TECHNOLOGY

Cattlemen can access computer technology in three ways. First, in a way we are all familiar with, are computer systems housed in a central processing location. A large main frame computer or a minicomputer is the usual hardware. The distinction between categories of computer hardware is becoming less clear. Generally main frame computers are larger and more costly, but offer greater precision and number crunching capability, followed by minicomputers, microcomputers and hand-held computers.

Computer specialists are necessary to operate mainframe - and minicomputer systems and to develop the software for them. From the ranchers' perspective the essential feature which distinguishes a larger computer from a personal computer (microcomputer) is the capability of the system to be operated by a non-professional user.

In the late 70's microcomputers seemed to burst onto the general market, offering a financially attractive way for individuals and small businesses to own a computer. Since the computer industry is emphasizing user-friendly software, the personal computer - vis-a-vis, microcomputer - undoubtedly will become widely used. Although prices vary, the bulk of the systems will range from $800.00 to $.5,000.00 with some of the most popular models ranging in price from $3,000.00 to $5,000.00.

Networking is a third way for ranchers to utilize computer resources. A relatively inexpensive acoustic coupler (about $300.00) will enable a rancher to send information over a telephone line from his/her microcomputer, or a simple terminal to a computer in another data processing location. The other location can be across the room or across the country. Information can be received in the same way.

Undoubtedly, networking in some form will be greatly expanded in the future. Ranchers will use a stand alone personal computer for many applications such as bookkeeping and other financial records as well as some performance records. However, for other problem solving applications, a rancher may not have the software that will run on his computer; the program may be too large for his microcomputer, or the program may require updated weather information, price forecasts or other information that the rancher cannot get conveniently. In those circumstances, a user who subscribes to a network (e.g. AGNET, TELPLAN) can utilize the problem solving programs in their network library.

Information transfer probably will be another very useful aspect of computer networks. The network can provide up-to-date market prices and analyses, and electronic mail. It can also be used as a marketing tool such as the "hay list" on AGNET or the electronic auction being developed in Texas. The list of applications for networking and all other ways to utilize the power of computers goes on and on.

From the users' perspective, the future of computers in beef production is characterized by the tasks the computer will be asked to perform and how cattlemen will access the computer. A number of applications have been touched upon in the previous presentation (Hughes) and have been mentioned here while describing access to computer systems. During the remaining time I will discuss a few suggested records for new computer programs which may help evaluate a breeding program from a systems perspective.

SYSTEMS RECORDS ARE NEXT BIF GOAL

Most presentations at the symposium have summarized research that illustrate the need to evaluate cattle from a systems perspective. The message has been that maximum performance among individual animals does not necessarily mean maximum production or profit for the ranch and that different cattle and different levels of performance may be required for different environments.

The next major goal for BIF is to develop quantitative guidelines which determine the best or optimal level of performance for individual animals that maximize production and/or profit for the ranch (system). Even though we presently do not have a precise, mathematical equation to do that, we can make some recommendations that will point us in the right direction.

Stated simply, ranch profit (i.e. a system objective) is total return minus total cost. Total return is determined by the number of animals marketed, their average weight and the average price per unit weight of the individuals. Similarly, total cost is determined by the number of animals in the inventory, the average resource use per inventory animal and average cost per unit of resource (e.g. land, labor and capital). The fundamental question that must be answered when selecting individual animals for a system obejective is "how does a change in the level of performance among individual animals affect the system objective (viz. ranch profit) when land, labor and capital resources are limited?"

In that regard variability of resource cost, market value and production efficiency are important considerations. First, although a resource may not strictly be limited, the marginal cost of an additional unit of resource may be different from the previous unit cost. We need to work cooperatively with economists to accommodate that in our decision making models.

The price per unit weight of each animal in a market class is another consideration. Through the years there has been a consensus among research results that cattle of all sizes are essentially equally efficient biologically and can have a desirable carcass composition if they are slaughtered at the right weight. In addition, we must know if the price per unit weight depends upon carcass size.

There seems to be a consensus within the industry that yield grade 2 and 3 carcasses between 600 and 800 pounds are most desirable. If it is more efficient biologically to produce something else, then producers need to know the market discount associated with that before making the decision. Perhaps a table such as shown below (table 1) would be useful. Each row and column could be expressed as a percent of the value for the preferred carcass or a dollar deviation from the value of the preferred carcass. It may vary by region of the country and quality grade. BIF should call upon meats scientists, industry representatives and economists to provide appropriate guidelines.

Table 1. Relative Carcass Value

Carcass Weight

Yield Grade	<400	500	600	700	800	900	>1000	
1								
2				Preferred				
3				Carcass				
4		Discount						
5		Values						

From a biological perspective the product of the number of animals in the system and animal size or level of performance determine total system production and total resource use. Many breed associations have a good performance program for evaluating size and growth rate. However, the performance programs do not monitor or use inventory information very well. A performance package which evaluates both animal size and inventory is essential in order to evaluate a breeding program from a systems perspective.

BIF should emphasize and provide guidelines for a good inventory control program that includes all animals in the system. The information which monitors entry into the system is essential to evaluate reproduction, while information which monitors exiting from the system is essential to evaluate longevity. Herd summaries of inventory information would be useful to evaluate genetic and management factors affecting reproduction and longevity.

When evaluating individual animals or a breeding program for a system objective, the effect of a genetic-environment interaction is an important consideration. Ranchers have been told to select cattle with a level of performance that is compatible with their environment. Therefore, quantitative methods for doing that are needed.

If differences in reproduction can be considered a major barometer for determining commercial important differences in adaptation, that is optimal performance for biological efficiency, then the tables below (tables 2 and 3) may provide a useful guide in that respect. Although the data from one year may have limited value, the accumulation of information may be quite helpful. Tables 2 and 3 represent data from the 1982 spring calving cows at Pedretti Herefords, El Nido, California. Since the number of animals was small, differences were not tested for statistical significance.

Table 2 shows the calving distribution by age of dam categories. The pattern among two-, three- and four-year old cows is an interesting observation relating to management. Since the three-year old cows calved ten days later, the table indicates the extent of the re-breeding problem.

Table 3 lists the average performance for several traits in categories of age of dam by calving period. It is an easily understood way to point out differences in adaptation or a genetic-environment interaction. In this example there appears to be no relationship between average calving date and the variation in height or maternal breeding value. However, if larger cows or heavier milking cows were not as well adapted in this environment, they would tend to calve later in the season. Cattlemen need to be able to quantify any such biological disadvantage in order to make sound management and selection decisions.

In this small sample the younger cows who calve earlier tend to be slightly heavier and carry more condition (W:H) than those who calve late. In contrast the reverse is true for older cows. Similar tables could be prepared for weaning breeding value, yearling breeding value and other performance traits.

Now that BIF has good guidelines available for the evaluation of growth traits, a significant effort should be made to develop an integrated performance - management information system that will help evaluate genetic decisions from a systems perspective. We need to guide software development for microcomputers and encourage the development of computer networks between cattlemen and their breed association or other data processing center.

TABLE 2 - Calving Distribution

Age of Dam	Calving	1	2	3	Average Day of Calving
Early 2	2	50	50	0	82
Late 2	28	61	21	18	78
3	15	13	33	54	88
4	19	63	26	11	78
5	10	80	10	10	74
6	4	75	0	25	78
7	3	100	0	0	73
8	5	20	60	20	85
Total	86	54.7	24.4	20.9	

Table 3 - Calving Distribution and Level of Performance

Age of Dam	Number Calving	M B V			$W - \bar{W}$			H			W / H		
		1	2	3	1	2	3	1	2	3	1	2	3
Early 2	2	102.0	99.5	-	67	-168	-	53.0	50.5	-	20.6	20.9	-
Late 2	28	103.9	102.5	100.9	9.5	18.8	-2.0	51.5	51.3	50.7	21.8	20.2	20.7
3	15	102.0	102.5	100.5	5.5	-15.0	22.4	52.5	52.2	52.3	23.4	23.1	23.8
4	19	101.3	99.2	100.8	-0.3	-25.0	40.5	52.0	52.6	52.8	26.4	25.6	26.9
5	10	102.9	101.1	99.0	-53.1	145.0	-55.0	51.4	54.0	50.2	25.7	28.2	26.3
6	4	99.1	-	100.9	52.3	-	NA	52.0	-	NA	29.6	-	NA
7	3	104.7	-	-	-93.0	-	-	51.3	-	-	26.5	-	-
8	5	104.0	106.2	111.4	-67.0	-8.7	78.0	52.5	51.6	51.8	25.5	27.1	28.7
Herd Totals	86	102.5	101.8	102.3	-9.9	-8.8	16.8	52.0	52.0	51.6	24.9	24.2	25.3

MBV - Maternal Breeding Value

$W-\bar{W}$ - Difference in weight (lbs) from age group mean

H - Height (inches) at the hip

W/H - Weight - Height ratio

MINUTES OF THE BOARD OF DIRECTORS
Beef Improvement Federation

Howard Johnson Motor Lodge
Rapid City, South Dakota
April 29, 1982

The meeting was called together by President Roger Winn at 7:05 a.m. on April 29, 1982. Those present included Directors Borror, Farmer, Holden, Keffeler, Martin, Masters, Peterson, Radakovich, Spader and Scarth plus Baker, Cundiff, Gillis, Gosey, Eller, Hubbard and Linton.

Minutes

The minutes of the mid-year Board of Directors meeting which was held on October 30 and 31, 1981, were read, Eller moved and Farmer seconded that the minutes be approved. Motion carried.

Financial Report

Art Linton circulated a financial statement for the Federation as of January 1, 1982. Borror moved and Keffeler seconded that the financial report be approved as circulated. Motion carried.

Executive Director's Report

Art Linton stated that, because of increased pressures related to his job, he is having less time available to spend working with BIF. For this reason he requested that a new Executive Secretary be identified prior to the next annual meeting. Baker moved that Linton's resignation be accepted in the time frame indicated and that the Board express its appreciation for a job well done. Martin seconded. Motion carried. A nominating committee to identify a new executive director was appointed as follows: Jack Farmer, Mark Keffeler, Dick Spader.

Meeting Format

President Winn suggested in the absence of chairman Bill Durfey, that the Reproduction Committee meet with Live Animal Evaluation.

Future Direction

Earl Peterson stated that he felt that there were three major areas where direction was needed in the performance movement and he urged that BIF move boldly in providing leadership in these areas. They are: 1. the performance evaluation of calves resulting from embryo transfer; 2. the utilization of linear measurements as predictors of subsequent performance; 3. the problem of appropriate adjustments for birth weights.

Others concurred that they felt that the 1983 meeting needed to be a working meeting in which there will be extensive time for committee activities. It was agreed that the committee structure needed to be re-examined and possibly revised before the mid-year meeting. Dixon Hubbard agreed to work on the structure and membership of BIF committees.

The meeting was recessed at 8:20 a.m. to be reconvened at 7:00 a.m. on April 30, 1982.

Respectfully submitted,

Arthur C. Linton
Executive Director

ACL:pc

BEEF IMPROVEMENT FEDERATION

FINANCIAL STATUS - January 1, 1982

by

Arthur C. Linton

	1-1-81	1-1-82
Checking Account	$1,189.34	$2,098.61
Savings Account	3,469.81	1,275.21
Certificate of Deposit	19,000.00	30,000.00
	$23,659.15	$33,373.82

1981 BIF INCOME

Dues	$7,700.00
Proceedings	73.50
Interest	3,196.72
Convention Income	3,926.34
TOTAL INCOME	$14,896.56

1981 BIF EXPENSES

Trophies	$269.20
Printing	1,324.69
Canadian discounts	40.00
Bank charges	2.80
Board meetings	403.80
Speaker travel	747.25
Ex. Dir. travel	944.50
Board travel	1,431.00
TOTAL EXPENSES	$5,163.24

MINUTES OF THE BOARD OF DIRECTORS
Beef Improvement Federation

Howard Johnson Motor Lodge
Rapid City, South Dakota
April 30, 1982

The meeting was called to order by President Roger Winn at 7:00 a.m. on April 30, 1982. Those present included Directors Borror, Butts, Farmer, Gibb, Holden, Keffeler, Martin, Peterson, Radakovich, Spader, Winn, Schroeder, Springer, Masters, Scarth and Wallace, plus Baker, Cundiff, Gosey, Eller, Hubbard and Linton.

Election of Directors

President Winn asked for a report on the election of directors. Linton reported that Gene Schroeder was re-elected to a second term as director representing the central BCIA's and that Roy Wallace was elected to represent the eastern BCIA's succeeding Roger Winn. Earl Peterson was elected to a second term representing breed associations. New breed association directors elected are Jim Gibb, American Polled Hereford Association, and Lyle Springer, American Red Angus Association.

Election of Officers

Jack Farmer, Chairman, gave the report of the nominating committee which included the nomination of Steve Radakovich as president and Bill Borror as vice president. Greg Martin moved and Dick Spader seconded that the report of the nominating committee be accepted and that a unanimous ballot be cast for both individuals. Motion carried. Steve Radakovich replaced Roger Winn as presiding officer at the meeting.

Mid-Year BIF Board Meeting

The place and date for the mid-year board meeting was discussed. The general consensus was that the Holiday Inn-KCI in Kansas City provided a desirable location and that the dates of November 5 and 6 were acceptable to most in attendance. October 29 and 30 were mentioned as alternative dates.

1983 Annual Meeting

The Board had voted to hold the 1983 annual meeting in Sacramento, California, at the 1981 Board meeting. In light of the increase in travel costs there was some concern expressed about the attendance that could be expected at a location that far removed from the center of the country. A brief survey indicated that it might be cheaper to go to such a location than it would to travel to Rapid City for many people.

Tentative dates for the 1983 meeting were identified as April 28 and 29 or May 5 and 6. Appointed to the program committee were Bill Borror, chairman, Greg Martin and Ike Eller.

1984 Convention

A discussion followed pertinent to the location for the 1984 annual meeting. Jack Farmer moved and Bob Scarth seconded that the 1984 meeting be held in Atlanta, Georgia. Motion carried.

COMMITTEE REPORTS

Sire Evaluation Committee

The minutes of this committee meeting were presented by Larry Cundiff, chairman, (see attached) and included two recommendations: 1. that expected progeny differences (EPD's) become the common terminology for expressing sire differences; 2. that PC rather than accuracy be the method of calculating prediction error or EPD values. Ike Eller moved acceptances of this report. Motion was seconded by Jim Gosey and was carried.

Live Animal Evaluation Committee

Chairman Dick Spader reported that discussion in this meeting centered on three subjects: 1. the need for adjustment factors to a standard age for scrotal circumference of bulls; 2. the need for an approved frame score table; and 3. the desire by some to have a frame score ratio. It was suggested that the beef breed associations conduct an analysis of the information available on hand to develop appropriate adjustment for bull age for their respective breed.

Greg Martin moved, Jack Farmer seconded, that BIF develop a standard frame score chart. Motion carried. President Radakovich appointed the following committee: Dick Spader, chairman, Jim Gibb and Roy Wallace to develop this chart and present it to the mid-year Board meeting.

1982 Convention

Frank Baker moved and Jack Farmer seconded that the Beef Improvement Federation express its thanks to Mark Keffeler and Dave Whittington for their hard work in hosting the 1982 BIF convention. Motion carried.

Adjournment

Dick Spader moved that the meeting be adjourned, Roy Wallace seconded the motion which was passed at 8:15 a.m.

Respectfully submitted,

Arthur C. Linton

Arthur C. Linton
Executive Director

ACL:pc

SIRE EVALUATION

The Open National Sire Evaluation Committee meeting was called to order by Larry Cundiff at the 1982 Annual BIF meeting. Three proposals were considered. The first proposal is attached. It concerned the use of EPD and EBVR. After lengthy discussion the proposal was passed as printed. The second proposal is attached. It concerned the use of PC in reporting of EPD values. Most agreed that PC was the method of choice, but that accuracy was an easier concept for breeders to understand. After discussion it was recommended that PC rather than accuracy be the method of calculating prediction error of EPD values. It was also recommended that PC be expressed as a percentage of perfect possible change and be called ACCURACY. Thus, accuracy would be

$$ACC = (1 - \frac{PC}{\sigma_G})$$

The third proposal was to adjust yearling weights used in sire evaluation for the selection bias at weaning by using procedures reported in the BIF guidelines. A copy of this proposal is attached. After discussion, the method will be tried out on the Charolais sire evaluation data and the importance of this procedure reported at the next meeting. Then action on the procedure would be taken. With no other business the committee meeting was adjourned.

Secretary,
R. L. Willham

PROPOSAL
to
Beef Improvement Federation Board of Directors
"EXPECTED PROGENY DIFFERENCES"
versus
"ESTIMATED BREEDING VALUE RATIOS"

R. L. WILLHAM

ANNUAL MEETING 1982

PROPOSAL

To avoid confusion in the beef industry, let us clearly state in our GUIDELINES that EXPECTED PROGENY DIFFERENCES computed using mixed model prediction (BLUP) will become the common terminology to report estimates of one-half the BREEDING VALUE. Reporting of EXPECTED PROGENY DIFFERENCES in units of the trait will gradually replace ESTIMATED BREEDING VALUE RATIOS as mixed model prediction procedures (BLUP) become used in within-herd analysis and in time over herds tied together by the use of common sires.

JUSTIFICATION

ESTIMATED BREEDING VALUE RATIOS for weaning and yearling weight were introduced in 1971 and those for MATERNAL BREEDING VALUE followed in 1974. These estimates are calculated by weighting own performance ratios and averages of ratios from relatives of the individual. The procedure WAS a good first approximation; the concept of VALUE as a BREEDING animal or PARENT is reasonably well established among performance breeders. However, the procedure does not compare favorably with mixed model prediction procedures (BLUP) currently being used to estimate EXPECTED PROGENY DIFFERENCES in both designed and field data sire evaluation. To date, EPD analyses simultaneously fit contemporary group effects and EPD values, adjust EPD values for competition among sires, and correct for genetic trend in some cases. None of these features occur in breeding value estimation as it is being done currently.

Reasonably soon, programs that incorporate mixed model prediction (BLUP) and the relationship of animals to estimate breeding values both within herds and across herds tied by common sires will be available. These breeding values will have the properties of the expected progeny differences from sire evaluation procedures so they will be comparable. Therefore, to gradually replace EBVR with EPD where EPD is an estimate of one-half of the true breeding value or what the parent is expected to transmit to its offspring expressed in units of the trait makes logical sense especially when the replacement denotes the use of a much better procedure of prediction as it has in the past!

PROPOSAL
to
Beef Improvement Federation Board of Directors
"PREDICTION ERROR"
versus
ACCURACY

R. L. Willham

ANNUAL MEETING 1982

PROPOSAL

Reporting the prediction error or POSSIBLE CHANGE in terms of ACCURACY should be avoided. Possible change should be reported for all EXPECTED PROGENY DIFFERENCES as

$$\text{EPD} \pm \sqrt{\frac{\text{Error Variance}}{\text{EPN} + \alpha}}$$

JUSTIFICATION

Predictions have an error of estimation attached to them. However, EXPECTED PROGENY DIFFERENCES as predictors are regressed back toward their average (zero) depending on the EFFECTIVE PROGENY NUMBER and the heritability of the trait. This makes the EPD values comparable even though the sires differ in EPN. Selection of sires should be based on their EPD value alone since the EPN has been considered in the estimation procedure. If the choice of a sire to use is high RISK, that is the breeding program of a breeder or the sales of a bull stud would suffer by the sire actually being at the lower end of his confidence interval, then some evaluation of prediction error should be included with the EPD values of sires. The question concerns just how to report the prediction error in terms that users can understand its meaning.

The only variable going in to prediction error is the EFFECTIVE PROGENY NUMBER which is the lead diagonal value for the sire equation if iteration is done or the reciprocal of the lead diagonal value of the inverse if this is used to get the EPD values. The prediction error is

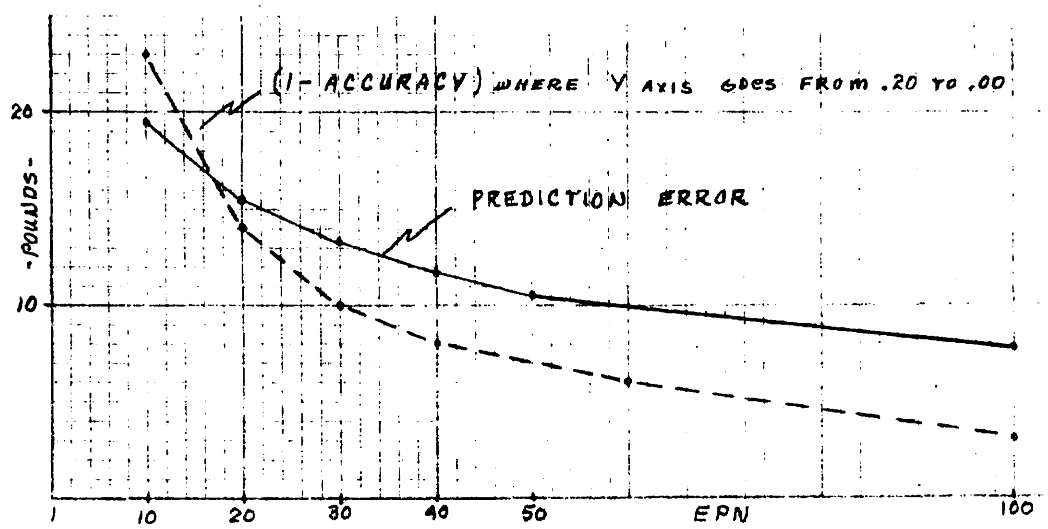
$$\text{PE} = \sqrt{\frac{\sigma_E^2}{\text{EPN} + \alpha}}$$

while the accuracy or the correlation between the true and estimated EPD is

$$r = \sqrt{\frac{\text{EPN}}{\text{EPN} + \alpha}} \text{ with } \alpha \text{ being the variance ratio, } \frac{\sigma_e^2}{\sigma_s^2}.$$

The EFFECTIVE PROGENY NUMBER is the number of progeny that are useful in the estimation of EPD. It is always less than the actual number of progeny. The prediction error and accuracy use EPN but scale it by either σ_e^2 and α or by α.

The prediction error is the measure of choice because it is related precisely to the particular EPD while the accuracy gives the correlation between the true value and large numbers of sires having the particular EPD. The prediction error decreases less rapidly than the accuracy increases as EPN increases. The accuracy gives the user too much confidence in the predictor as EPN increases past 30. The raw EPN values also give the user



too much confidence because they go down in a linear fashion. That is 40 EPN is twice as good as 20 EPN and it is not in terms of prediction error. Therefore, to give the user under high risk a value that is useful, the PREDICTION ERROR or the POSSIBLE CHANGE calculated as

$$PC = \sqrt{\frac{\text{Error Variance}}{\text{EPN} + \alpha}}$$

should be reported for each EPD calculated in sire evaluation. If another value such as EPN is reported a table relating EPN to PC should be given.

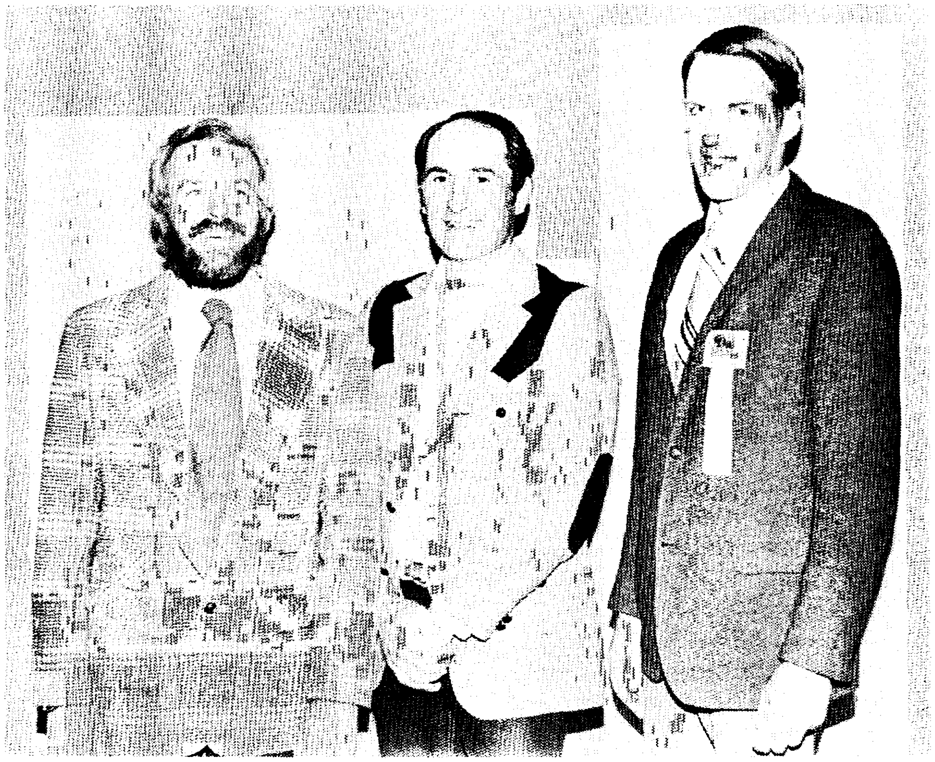


Photo Courtesy of Tri-State Livestock News

Officers Left to Right: Bill Borros, V. P. Gerber, California, Steve Radakovich, President, Earlham, Iowa, Art Linton, Exec. Director, Bozeman, Montana.

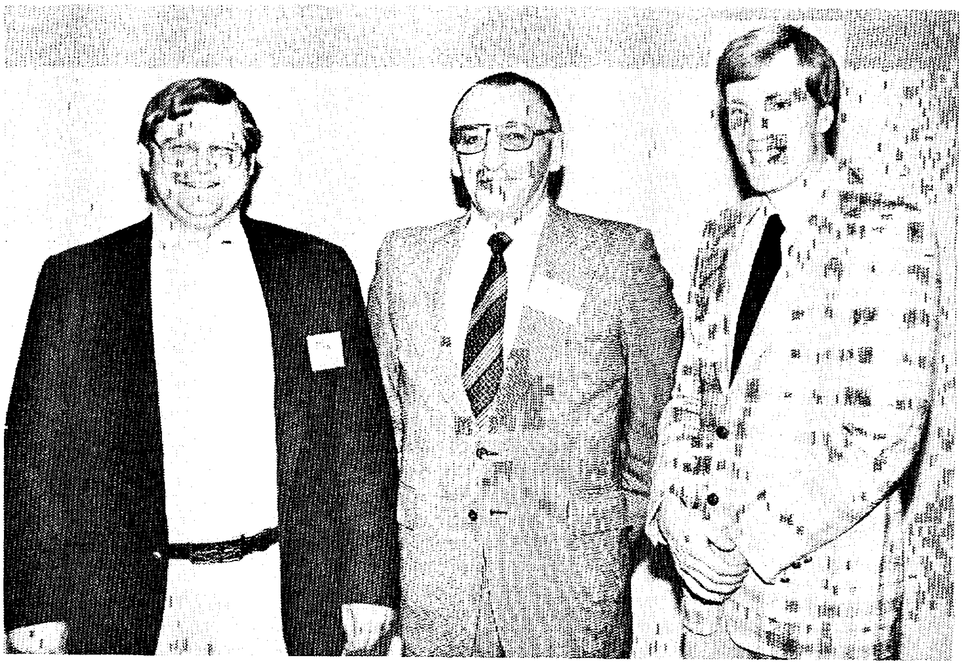


Photo Courtesy of Tri-State Livestock News

New Board Members Left to Right: Roy Wallace, Columbus, Ohio, Eastern BCIA's; Lyle Springer, Denten, Texas, American Red Angus Association; Jim Gibb, Kansas City, American Polled Hereford Association.

BIF AWARDS PROGRAM

The Commercial Producer Honor Roll of Excellence

Chan Cooper	MT	1972
Alfred B. Cobb, Jr.	MT	1972
Lyle Eivens	IA	1972
Broadbent Brothers	KY	1972
Jess Kilgore	MT	1972
Clifford Ouse	MN	1973
Pat Wilson	FL	1973
John Glaus	SD	1973
Sig Peterson	ND	1973
Max Kiner	WA	1973
Donald Schott	MT	1973
Stephen Garst	IA	1973
J. K. Sexton	CA	1973
Elmer Maddox	OK	1973
Marshall McGregor	MO	1974
Lloyd Nygard	ND	1974
Dave Matti	MT	1974
Eldon Wiese	MN	1974
Lloyd DeBruycker	MT	1974
Gene Rambo	CA	1974
Jim Wolf	NE	1974
Henry Gardiner	KS	1974
Johnson Brothers	SD	1974
John Blankers	MN	1975
Paul Burdett	MT	1975
Oscar Burroughs	CA	1975
John R. Dahl	ND	1975
Eugene Duckworth	MO	1975
Gene Gates	KS	1975
V. A. Hills	KS	1975
Robert D. Keefer	MT	1975
Kenneth E. Leistritz	NE	1975
Ron Baker	OR	1976
Dick Boyle	ID	1976
James D. Hackworth	MO	1976
John Hilgendorf	MN	1976
Kahua Ranch	HI	1976
Milton Mallery	CA	1976
Robert Rawson	IA	1976
Wm. A. Stegner	ND	1976
U.S. Range Experiment Station	MT	1976
John Blankers	MN	1977
Maynard Crees	KS	1977
Ray Franz	MT	1977
Forrest H. Ireland	SD	1977
John A. Jameson	IL	1977
Leo Knoblauch	MN	1977
Jack Pierce	ID	1977
Mary & Stephen Garst	IA	1977

Odd Osteroos	ND	1978
Charles M. Jarecki	MT	1978
Jimmy G. McDonnal	NC	1978
Victor Arnaud	MO	1978
Ron & Malcolm McGregor	IA	1978
Otto Uhrig	NE	1978
Arnold Wyffels	MN	1978
Bert Hawkins	OR	1978
Mose Tucker	AL	1978
Dean Haddock	KS	1978
Myron Hoeckle	ND	1979
Harold and Wesley Arnold	SD	1979
Ralph Neill	IA	1979
Morris Kuschel	MN	1979
Bert Hawkins	OR	1979
Dick Coon	WA	1979
Jerry Northcutt	MO	1979
Steve McDonnell	MT	1979
Doug Vandermyde	IL	1979
Norman, Denton and Calvin Thompson	SD	1979
Jess Kilgore	MT	1980
Robert & Lloyd Simon	IL	1980
Lee Eaton	MT	1980
Leo & Eddie Grubl	SD	1980
Roger Winn, Jr.	VA	1980
Gordon McLean	ND	1980
Ed Disterhaupt	MN	1980
Thad Snow	CAN	1980
Oren & Jerry Raburn	OR	1980
Bill Lee	KS	1980
Paul Moyer	MO	1980
G. W. Campbell	IL	1981
J. J. Feldmann	IA	1981
Henry Gardiner	KS	1981
Dan L. Weppler	MT	1981
Harvey P. Wehri	ND	1981
Dannie O'Connell	SD	1981
Wesley & Harold Arnold	SD	1981
Jim Russel and Rick Turner	MO	1981
Oren and Jerry Raburn	OR	1981
Orin Lamport	SD	1981
Leonard Wulf	MN	1981

1982

Wm. H. Romersberger	IL	1982
Marvin & Donald Stoker	IA	1982
Sam Hands	KS	1982
Larry Campbell	KY	1982
Lloyd Atchison	CAN	1982
Earl Schmidt	MN	1982
Milton Krueger	MO	1982

Carl Odegard	MT	1982
Raymond Josephson	ND	1982
Clarence Reutter	SD	1982

BIF AWARDS PROGRAM

The Seedstock Breeder Honor Roll of Excellence

John Crowe	CA	1972
Dale H. Davis	MT	1972
Elliot Humphrey	AZ	1972
Jerry Moore	OH	1972
James D. Bennett	VA	1972
Harold A. Demorest	OH	1972
Marshall A. Mohler	IN	1972
Billy L. Easley	KY	1972
Messersmith Herefords	NE	1973
Robert Miller	MN	1973
James D. Hemmingsen	IA	1973
Clyde Barks	ND	1973
C. Scott Holden	MT	1973
William F. Borror	CA	1973
Raymond Meyer	SD	1973
Heathman Herefords	WA	1973
Albert West III	TX	1973
Mrs. R. W. Jones, Jr.	GA	1973
Carlton Corbin	OK	1973
Wilfred Dugan	MO	1974
Bert Sackman	ND	1974
Dover Sindelar	MT	1974
Jorgensen Brothers	SD	1974
J. David Nichols	IA	1974
Bobby Lawrence	GA	1974
Marvin Bohmont	NE	1974
Charles Descheemaeker	MT	1974
Bert Crane	CA	1974
Burwell M. Bates	OK	1974
Maurice Mitchell	MN	1974
Robert Arbuthnot	KS	1975
Glenn Burrows	NM	1975
Louis Chesnut	WA	1975
George Chiga	OK	1975
Howard Collins	MO	1975
Jack Cooper	MT	1975
Joseph P. Dittmer	IA	1975
Dale Engler	KS	1975
Leslie J. Holden	MT	1975
Robert D. Keefer	MT	1975
Frank Kubik, Jr.	ND	1975
Licking Angus Ranch	NE	1975
Walter S. Markham	CA	1975

Gerhard Mittness	KS	1976
Ancel Armstrong	VA	1976
Jackie Davis	CA	1976
Sam Friend	MO	1976
Healy Brothers	OK	1976
Stan Lund	MT	1976
Jay Pearson	ID	1976
L. Dale Porter	IA	1976
Robert Sallstrom	MN	1976
M. D. Shepherd	ND	1976
Lowellyn Tewksbury	ND	1976
Harold Anderson	SD	1977
William Borror	CA	1977
Rob Brown, Simmental	TX	1977
Glenn Burrows, PRI	NM	1977
Henry & Jeanette Chitty	FL	1977
Tom Dashiell, Hereford	WA	1977
Lloyd DeBruycker, Charolais	MT	1977
Wayne Eshelman	WA	1977
Hubert R. Freise	ND	1977
Floyd Hawkins	MO	1977
Marshall A. Mohler	IN	1977
Clair Percel	KS	1977
Frank Ramackers, Jr.	NE	1977
Loren Schlipf	IL	1977
Tom and Mary Shaw	ID	1977
Bob Sitz	MT	1977
Bill Wolfe	OR	1977
James Volz	MN	1977
A. L. Grau		1978
George Becker	ND	1978
Jack Delaney	MN	1978
L. C. Chestnut	WA	1978
James D. Bennett	VA	1978
Healey Brothers	OK	1978
Frank Harpster	MO	1978
Bill Womack, Jr.	AL	1978
Larry Berg	IA	1978
Buddy Cobb	MT	1978
Bill Wolfe	OR	1978
Roy Hunt	PA	1978
Del Krumwied	ND	1979
Jim Wolf	NE	1979
Rex and Joann James	IA	1979
Leo Schuster Family	MN	1979
Bill Wolfe	OR	1979
Jack Ragsdale	KY	1979
Floyd Mette	MO	1979
Glenn and David Gibb	IL	1979
Peg Allen	MT	1979
Frank and Jim Willson	SD	1979
Donald Barton	UT	1980
Frank Felton	MO	1980

Frank Hay	CAN	1980
Mark Keffeler	SD	1980
Bob Laflin	KS	1980
Paul Mydland	MT	1980
Richard Tokach	ND	1980
Roy & Don Udelhoven	WI	1980
Bill Wolfe	OR	1980
John Masters	KY	1980
Floyd Dominy	VA	1980
James Bryan	MN	1980
Blythe Gardner	UT	1980
Richard McLaughlin	IL	1980
Charlie Richards	IA	1980
Bob Dickinson	KS	1981
Clarence Burch	OK	1981
Lynn Frey	ND	1981
Harold Thompson	WA	1981
James Leachman	MT	1981
J. Morgan Donelson	MO	1981
Clayton Canning	CAN	1981
Russ Denowh	MT	1981
Dwight Houff	VA	1981
G. W. Cornwell	IA	1981
Bob and Gloria Thomas	OR	1981
Roy Beeby	OK	1981
Herman Schaefer	IL	1981
Myron Aultfather	MN	1981
Jack Ragsdale	KY	1981

1982

W. B. Williams	IL	1982
Garold Parks	IA	1982
David A. Breiner	KS	1982
Joseph S. Bray	KY	1982
Clare Geddes	CAN	1982
Howard Krog	MN	1982
Harlin Hecht	MN	1982
Willard Kottwitz	MO	1982
Larry Leonhardt	MT	1982
Frankie Flint	NM	1982
Gary & Gerald Carlson	ND	1982
Bob Thomas	OR	1982
Orville Stangl	SD	1982

Continuing Service Awards

Clarence Burch	Oklahoma	1972
F. R. Carpenter	Colorado	1973
E. J. Warwick	ARS-USDA Wash. DC	1973
Robert De Baca	Iowa State Univ.	1973
Frank H. Baker	Okla. State Univ.	1974
D. D. Bennett	Oregon	1974
Richard Willham	Iowa State Univ.	1974
Larry V. Cundiff	RLHUSMARC	1975
Dixon D. Hubbard	USDA-FES, Wash. DC	1975
J. David Nichols	Iowa	1975
A. L. Eller, Jr.	VPI & SU	1976
Ray Meyer	South Dakota	1976
Don Vaniman	Montana	1977
Lloyd Schmitt	Montana	1977
Martin Jorgensen	South Dakota	1978
James S. Brinks	Col. State Univ.	1978
Paul D. Miller	Am. Breeding Svc-Wis.	1978
C. K. Allen	Am. Angus Assn.	1979
Wm. Durfey	NAAB	1979
Glenn Butts	PRI	1980
Jim Gosey	Univ. of Neb.	1980
Mark Keffeler	South Dakota	1981

1982

J. D. Mankin	Idaho	1982

Commercial Producer of the Year

Chan Cooper	MT	1972
Pat Wilson	FL	1973
Lloyd Nygard	ND	1974
Gene Gates	KS	1975
Ron Baker	OR	1976
Steve and Mary Garst	IA	1977
Mose Tucker	AL	1978
Bert Hawkins	OR	1979
Jess Kilgore	MT	1980
Henry Gardiner	KS	1981

1982

Sam Hands	KS	1982

Seedstock Breeder of the Year

John Crowe	CA	1972
Mrs. R. W. Jones	GA	1973
Carlton Corbin	OK	1974
Leslie J. Holden	MT	1975
Jack Cooper	MT	1975
Jorgensen Brothers	SD	1976
Glenn Burrows	NM	1977
James D. Bennett	VA	1978
Jim Wolf	NE	1979
Bill Wolfe	OR	1980
Bob Dickinson	KS	1981

1982

A. F. "Frankie" Flint	NM	1982

Organizations of the Year

Beef Improvement Committee, Oregon Cattlemen's Assn.	1972
South Dakota Livestock Production Records Assn.	1973
American Simmental Association, Inc.	1974
American Simmental Association, Inc. (Breed)	1975
Iowa Beef Improvement Association (BCIA)	1975
The American Angus Association (Breed)	1976
The North Dakota Beef Cattle Improvement Assn. (BCIA)	1976
The American Angus Association (Breed)	1977
The Iowa Beef Improvement Association (BCIA)	1977
The American Hereford Association (Breed)	1978
Beef Performance Committee or Cattlemen's Assn.	1978
The Iowa Beef Improvement Association (BCIA)	1979

Pioneer Awards

Jay L. Lush	Iowa State Univ.	Research	1973
John H. Knox	New Mexico State Univ.	Research	1973
Ray Woodward	American Breeders Svc.	Research	1974
Fred Willson	Montana State Univ.	Research	1974
Charles E. Bell, Jr.	USDA-FES	Education	1974
Reuben Albaugh	Univ. of California	Education	1974
Paul Pattengale	Colorado State Univ.	Education	1974
Glenn Butts	Performance Registry Intl.	Service	1975
Keith Gregory	RHLUSMARC	Research	1975
Bradford Knapp, Jr.	USDA	Research	1975
Forrest Bassford	Western Livestock Journal	Journalism	1976
Doyle Chambers	Louisiana State Univ.	Research	1976
Mrs. Waldo Emerson Forbes	Wyoming Breeder	Breeder	1976
C. Curtis Mast	Virginia BCIA	Education	1976
Dr. H. H. Stonaker	Colorado State Univ.	Research	1977
Ralph Bogart	Oregon State Univ.	Research	1977
Henry Holszman	South Dakota State Univ.	Education	1977

Marvin Koger	Univ. of Florida	Research	1977
John Lasley	Univ. of Missouri	Research	1977
W. C. McCormick	Tifton, Georgia Test Stn.	Research	1977
Paul Orcutt	Montana Beef Perf. Assn.	Education	1977
J. P. Smith	Performance Registry Intl.	Education	1977
James B. Lingle	Wye Plantation	Breeder	1978
R. Henry Mathiessen	Virginia Breeder	Breeder	1978
Bob Priode	VPI & SU	Research	1978
Robert Koch	RLHUSMARC	Research	1979
Mr. & Mrs. Carl Roubicek	Univ. of Arizona	Research	1979
Joseph J. Urick	U.S. Range Livestock Experiment Station	Research	1979
Bryon L. Southwell	Georgia	Research	1980
Richard T. "Scotty" Clark	USDA	Research	1980
F. R. "Ferry" Carpenter	Colorado	Breeder	1980
Clyde Reed	Oklahoma State Univ.		1981
Milton England	Panhandle A&M College		1981
L. A. Maddox	Texas A&M Univ.		1981
Charles Pratt	Oklahoma		1981
Otha Grimes	Oklahoma		1981

1982

Mr. & Mrs. Percy Powers	Texas		1982
Gordon Dickerson	Nebraska		1982

1982 COMMERCIAL PRODUCER OF THE YEAR

Sam Hands, Garden City, Kansas rancher was named the 1982 Commercial Producer of the Year by the Beef Improvement Federation. Hands was nominated for the award by the Kansas Livestock Association Beef Improvement Committee.

Hands operates a 350 head Angus/Simmental cowherd in a family partnership, Triangle H Grain & Cattle Company, near Garden City. The partners in the operation are Sam, his father Fielding, and brothers Gregg and Cedric.

Hands' operation utilizes artificial insemination and the cows are kept on irrigated pasture in the summer and corn and milo stover fields during fall and winter. He has been keeping performance records on his cowherd for fourteen years. Hands uses the National Sire Summaries and the National Sire Evaluation data to select both AI and clean-up bulls.

Hands is a long time advocate of performance testing and has made significant imporvements in his herd through selection. 205-day adjusted weights have come from a low of 375 lbs. in the fall herd and 425 lbs. in the spring herd to a current average of 530 lbs. Yearling weights have increased from 650 lbs. to 775 lbs. Feedlot performance of those cattle fed out is also maintained and, whenever possible, carcass data is collected. Feedlot gain has increased from 2.8 to 3.7 lbs. per day with loin eye areas measuring 14.1 square inches vs. 12 square inches ten years ago, while reducing external fat by 2/10 inch.

Individual cow performance cards are kept and include ancestry as well as calves' performance and index ratio. Evaluations of the bulls used in this operation are arrived at from the feedlot data on a comparative basis.

Hands has been active in several livestock organizations and events, including the annual Kansas Beef Empire Days, an event designed to focus attention on superior performance cattle. His operation is the host of many tours by various livestock groups. In these ways Hands does his part in promoting the efficient production of beef cattle and encouraging others to utilize the performance principles endorsed by Beef Improvement Federation.

Mr. SAM HANDS

1982 COMMERCIAL PRODUCER OF THE YEAR

1982 SEEDSTOCK PRODUCER OF THE YEAR

A. F. "Frankie" Flint, longtime Bard, New Mexico, rancher and Angus breeder, was honored as the 1982 BIF Seedstock Producer of the Year. Flint, a performance pioneer and respected performance advocate, has had a major impact upon his breed and the commercial cattle of the southwest through the genetic contribution of Flint Angus and through the philosophical impact Frankie has had on other cattlemen. Frankie started keeping records on his commercial herd in the thirties, selecting and culling for growth, milking ability and soundness. When he purchased his first registered cattle in the late 40's the weaning weights on his purebred calves were 100 pounds lighter than those of his commercial calves. Through the use of the available performance tools such as PRI, AHIR and central bulls tests Flint has made progress in near textbook fashion. Never one to avoid objective competition, Flint has participated in bull tests at six locations including twenty-one years at Tucumcari, New Mexico. While in most cases his bulls were at or near the top in terms of gain, where another breeder's bulls proved superior, Frankie usually took one home to add to his program. An NMSU analysis of Tucumcari records showed that Flint cattle improved 50 pounds in a test weight, 175 pounds in final weight and .9 pound in average daily gain over the 20 year period.

Flint cattle have impacted the industry through several ways. Semen from Flint bulls has been merchandized successfully by several A.I. studs. Flint bulls and females have provided the foundation for several progressive purebred herds. Commercial cattlemen have long recognized the Flint herd as being a dependable source of herd improving bulls.

Frankie has long been recognized as a leader by his fellow cattlemen and they have called upon him to serve them in a variety of ways. He was a member of the first BIF Board and served on the sire evaluation committee. For six years he has served as a Board member for the American Angus Association and has helped provide leadership for the breed's AHIR program through his membership on that committee. His impact in his native state has been equally impressive and he was honored as the 1980 New Mexico Cattleman of the Year. His is a fitting recipient of the 1982 BIF Seedstock Producer of the Year award.

Photo Courtesy of Tri-State Livestock News

Mr. & Mrs. Frankie Flint
1982 Seedstock Producer of the Year

1982 CONTINUING SERVICE AWARD

J. D. Mankin, Extension Animal Scientist, University of Idaho, was presented a Continuing Service Award by the Beef Improvement Federation during the annual meeting held in Rapid City, South Dakota, April 29-30.

J. D. Mankin has been a leader in developing and adapting performance record data to commercial management systems. An active leader in the Commercial Herd Committee of the Beef Improvement Federation, he is credited with much of the current material in the commercial applications section of the Beef Improvement Guidelines for performance testing.

J. D.'s presentation at the 1982 National Beef Improvement Federation meeting on 'Developing and Adapting Systems to Commercial Cattlemen' is further testimony to his continuing service.

The Continuing Service Award is intended to show appreciation for long-time service and an overall "job well done".

Photo Courtesy of Tri-State Livestock News

J. D. Mankin

BIF Continuing Service Award

from Frank Baker

1982 PIONEER AWARD

Mr. & Mrs. Percy Powers, Perryton, Texas ranchers, were presented a Pioneer Award by the Beef Improvement Federation at the annual meeting in Rapid City, South Dakota, April 29-30.

Percy and his wife, Lois, started in the cattle business in 1937 with two Angus cows and their heifer calves. He has never had more than 80 Angus cows at any one time, yet, his Skyland Farms has been the fountainhead for many of the popular Angus bloodlines of today. This soft-speaking Texas Panhandle rancher has had as much influence on the Angus breed as any man living.

The real story of Percy Powers' Angus cattle began in 1950. That was the first year of the Pan Tech Test Station, a bull evaluation center northeast of Amarillo. On this test the first year there were 20 pens of calves representing 20 different sires from various breeders. The revolutionary idea of this first test was to identify the superior sires.

"Interest was growing," say Powers, "at the time to identify the high gaining cattle and PRI was organized with the purpose of finding those cattle. This was at a time when very few people were even weighing their calves. The commercial man," continues Powers, "has always been the backbone of this business and they have always made their money at the scales. When the commercial cattlemen realized what we were trying to do they loved it."

Performance Registry International was the forerunner of such breed programs as the Herefords TPR program and the Angus AHIR performance program. Many PRI breeders have since enrolled in their breed association's program but it was PRI that got many people thinking performance.

Dr. Gordon E. Dickerson, geneticist, Roman H. Ruska Meat Animal Research Center/University of Nebraska was presented a Pioneer Award by the Beef Improvement Federation at the annual meeting in Rapid City, South Dakota, April 29-30.

Dr. Dickerson, a long time leader in genetics research, is one of the world's leading geneticists among contemporary scientists. Some of his more recent contributions have included research in the areas of: sequential selection, selection based first on individual performance then on progeny; repeat mating schemes to evaluate genetic change; selection indexes for efficient beef production; germ plasm resource evaluation in beef cattle, sheep, and swine and selection for efficient lean growth. He authored the monograph on techniques and procedures for animal breeding research for the American Society of Animal Science.

Besides these many contributions to research, Dr. Dickerson has supervised the graduate training of many of the leading animal geneticists in the United States.

ATTENDANCE - BEEF IMPROVEMENT FEDERATION CONFERENCE - 1982

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