Summary of Reports

3rd Annual Beef Cattle Day

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CONTENTS

Review of Current Beef Cattle Research

at Oregon State University

J. C. Miller

Research---What is it?

Before discussing our current beef cattle research efforts, perhaps we should find a common ground for the meaning of research. Webster defines it as "Studious inquiry; usually critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions in the light of newly discovered facts". This definition permits broad interpretation and obviously covers everything from the most basic to the applied or experimental type of study. Both are essential for an effective Agricultural Experiment Station program. In fact the Hatch Act of 1887 which established the Agricultural Experiment Stations as a part of our Land Grant Colleges specified that agricultural research, both basic and applied, be pursued and supported by state and federal funds.

A simple illustration may help to distinguish between basic and applied research. Two animals of like breeding, age and weight may differ widely in their response to the same ration. Recording of such observations under a carefully designed and controlled experiment may meet the requirements for applied research, but it tells us nothing about WHY one animal makes better use of his feed than the other. To determine the WHY may involve a detailed study in genetics, physiology of digestion, basal metabolism, blood chemistry, rumen microorganisms, vitamin synthesis and other tests either independently or in combination. There are no easy answers or simple solutions to the WHYS of animal response, whether it be in the breeding herd, on the range or in the feedlot. But we must know the WHYS if we are to make the best use of our cattle, feed, and other resources involved in the beef making business.

Unfortunately, learning the WHYS is in most cases extremely complex and requires highly trained specialists in a number of disciplines to provide the team effort essential for success. Solutions may require years of research and large sums of money.

The white muscle research story is an excellent example. Years of team effort involving a veterinarian, a biochemist and a nutritionist led to the discovery that a minute quantity of selenium salt in the diet of the pregnant female will prevent white muscle in lambs and calves. Injectable preparations are now successfully used on calves and lambs as a result of this discovery. But the researchers are not through. They still don't know why nor how selenium functions to prevent the condition known as white muscle, or muscular dystrophy.

Variety of projects

Beef cattle research by the OSU Agricultural Experiment Station covers a wide variety of projects and involves a considerable number of scientists in several departments and branch stations. The Administration encourages and we enjoy splendid co-operation with a number of departments on many projects of mutual interest. Most of the basic or semi-basic research is conducted at the Corvallis station where laboratories, library and personnel from cooperating departments are available. Except for some basic work at the Squaw Butte Station, most work at branch stations would fall in the category of applied research.

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Branch stations were established because of the wide variety of soil, climate, feed, parasite and disease conditions found in Oregon. However, it is obvious the Experiment Station cannot establish research centers in all of the distinct environmental areas of the state. To partially meet this need, demonstrations in cooperation with producers have been conducted and may be expanded as the need arises.

General areas of beef cattle research are listed below.

1. Beef Cattle Improvement
   Basic---genetic, physiological, metabolic and growth studies.
   Applied---breeding systems, performance studies.

2. Nutrition
   Basic---rumen physiology, digestion trials, minor element studies.
   Applied---feeding trials, wintering levels, weaning age.

3. Management
   Basic---physiology of reproduction, fertility studies, nutritional deficiencies.
   Applied---growth studies, health and sanitation, parasites, winter supplementation.

4. Range and Pasture Investigations
   Basic---range ecological studies, range evaluation techniques, development of new forage plants.
   Applied---range improvement and management, pasture and forage evaluation, improvement and management.

Projects are reviewed

All research projects related to beef cattle are reviewed annually and revised regularly as indicated by results and progress of the work. Each year some projects are terminated and new ones are submitted. Projects come from ideas and ideas originate in individuals. Before an idea can be transformed into an approved research project it must pass through an evolutionary process. First, it is submitted to the department head or station superintendent by the individual or team. If it involves two or more subject matter areas, the department heads or superintendents designate qualified personnel to examine the proposal in detail. It must be designed so that results can be interpreted and analyzed statistically and qualified leaders, coleaders and advisors must be designated. The project must be justified by a statement of need, the pertinent literature in the field reviewed, the objectives and procedures clearly defined and a budget proposed.

The proposal is usually revised two or three times by those submitting it before it reaches the department head or superintendent. He in turn may approve it and forward it to the Director of the Station, but this seldom happens. Usually he refers it to another department head or section leader for review or back to the originator with suggestions for revision. When everyone concerned is satisfied, a project is then signed by the leaders and the department heads and forwarded to the Director of the Experiment Station.

Some projects are supported in past by private grants, others are on contract with government agencies, and many are approved for federal aid by the State Experiment Stations Division of the U. S. Department of Agriculture. The rising costs of labor and research equipment present problems, but most serious is the competition from industry and government research agencies for top young scientists.

A list of current research projects related to beef cattle is included. Some of these are being terminated and new ones are on the waiting list. Research projects on cattle feeding problems in the Columbia Basin counties are now in the planning stage and do not show on the list. Carcass evaluation data is the weakest link in our chain of information. Until we have adequate meat research facilities we are limited to what we can get from commercial slaughter houses. Present plans call for the construction of certain of the needed facilities during the next biennium.

We invite your suggestions and welcome your support.

List of Current Research Projects
Directly Related to Beef Cattle

Project No.	Title, Leader and Cooperating Departments
1	Improvement of Beef Cattle Through Breeding Methods Using Basic Physiological Differences in Rate and Efficiency of Gain. Ralph Bogart, DAH; Squaw Butte-Harney Station.
61	Biochemical Investigations of Metabolic and Nutritional Disorders in Livestock J. R. Haag, Agr. Chem.; DAH; Vet. Med.; Br. Stations.
80	Improvement of Forage Crops by Breeding. J. R. Cowan; Farm Crops; Agr. Chem.
97	Arthropods Affecting Man and Animals. R. Goulding, Entomology; DAH; Vet. Med.; Poultry; Agr. Chem.; Ext. Service.
154	Minor Elements in Animal Nutrition. J. R. Haag, Agr. Chem.;DAH; Vet. Med.
155	Increasing Fertility on Male Farm Animals Through Improvement of Semen Prouuction, Evaluation and Preservation. A. Wu, DAH; Agr. Chem.
158	The Development and Evaluation of Breeding Systems in Parctical Livestock Production. D. C. England, DAH; cattle producers.
160	Developing Improvement and Management Practices for Semi-Arid and Range and Foothill Pastures. D. W. Hedrick, DAH; Farm Crops.
161	Production and Management of Improved Pastures. W. S. McGuire, Farm Crops; Soils; DAH; Agr. Engr.
*175	Determination of Nature and Control of White Muscle Disease. O. H. Muth, Vet. Med.; DAH; Agr. Chem.

*264 The Development and Application to Feeding Practices of Techniques for Measuring Range Feed Consumption and Quality by Beef Cattle. J. E. Oldfield, DAH; Squaw Butte-Harney Br. Sta.

*265 Feeding and Management Practices for Cow-Calf Beef Cattle Production in Eastern Oregon Other Than the High Desert. J. A. B. McArthur, East. Ore. Br. Sta.; DAH.

*278 Cardiovascular Adjustments to Environmental Stresses in Cattle and Sheep H. Krueger and W. C. Van Arsdel, DAH.

289 Improving Roughage Use by Ruminants Through Supplementation with Nutrient and Non-Nutrient Materials. D. C. Church, DAH.

*293 Nature and Control of Anaplasmosis in Cattle. O. H. Muth, Vet. Med.; Entomology; Squaw Butte-Harney Station.

300 Determine Best Use and Improvement Practices for Foothill Ranges, both Open and Forested in N. E. Oregon, J. A. B. McArthur, East. Ore. Br. Sta.; Farm Crops; DAH; Forest Research Division.

*316 Development and Testing of Equipment for Seeding Grasses on the Sagebrush-Bunchgrass Ranges. D. E. Booster, Ag. Engr.; Squaw Butte-Harney Branch Station.

320 Improvement of Range Livestock Production in the Oregon High Desert Area Through Nutrition and Management Research. R. Raleigh, Squaw Butte Station; DAH; Agr. Chem.

321 Improvement of S. E. Oregon Ranges Through Reseeding and Management D. N. Hyder, Squaw Butte Station; DAH; Farm Crops.

322 Range Improvement in S. E. Oregon Through Control of Undesirable Plants. D. N. Hyder, Squaw Butte Station; DAH; Farm Crops.

*362 Development of Fundamental Vegetation--Soils Classification for Non-Forested Ranges in Oregon as a Basis for Range Improvement and Management. C. R. Poulton, DAH; Farm Crops; Fish and Game; Soils.

377 Testing Various Feed Stuffs and Nutrients and Non-Nutrient Additives with Feedlot Beef Cattle in Eastern Oregon. E. N. Hoffman, Malheur Branch Station; DAH.

*394 Profitability of Improvement Practices for Oregon Rangeland. W. G. Brown, Ag. Econ.; DAH.

385 Improved Beef Cattle Nutrition in Oregon's Coastal Area. H. B. Howell, Astor Station; DAH.

*399 Development of Quality Prediction Techniques for Use in Development and Marketing Frozen Beef Through Fruit and Vegetable Channels, D. C. England, DAH; Food and Dairy Tech.

404 Economic Analysis of Animal Feeding Practices in Oregon. W. G. Brown, Ag. Econ.; DAH.

*408 The Application of Rumen Studies to the Evaluation of Feedstuffs, Utilizing in Vivo and Vitro Rumen Metabolic Techniques. F. G. Hueter, DAH.

*413 Development of a Method of Defining the Quality of Retail Cuts of Fresh Beef. A. F. Anglemier, Food and Dairy Tech.; DAH.

*427 The Study of Normal and Altered Ruminant Liver Metabolism Utilizing Radioisotopic Techniques. F. G. Hueter, DAH (Contract A. E. C.)

429 Place of Forestry, Grazing or Joint Use on Foothill Lands in Oregon. D. W. Hedrick, DAH; Farm Crops; For. Res. Div.; East. Ore. Bra. Sta.

*433 The Bionomics, Pathogenicity and Control of Ruminant Nematodes. S. E. Knapp, Vet. Med.; DAH.

437 A survey of Livestock Fertility in Oregon. A. T. Ralston, DAH.

*440 Quality of Beef and its Possible Relationship to Certain Blood Components in the Animals Producing the Beef. A. F. Anglemier, Food and Dairy Tech.; DAH.

445 Evaluation of New Livestock Feeding and Management Practices Under Ranch and Feedlot Condidtions. D. C. Church, DAH.

486 The Control of Medusahead on Oregon Ranges. C. E. Poulton, DAH; W. R. Furtick, Farm Crops.

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Major Problems With Minor Elements

J. E. Oldfield

Among the essential mineral elements in cattle rations, some, like iron, copper, and cobalt have been given the name "minor" or "trace" elements because they normally are present in small amounts. While minor in quantity, they are of major importance to an animal, and some serious cattle production problems relate to the supply of these elements in forage and feed. As just one example, less than one part per million of cobalt in the ration may make the difference between normal health and a wasting death for cattle.

It is very difficult to generalize about minor element problems, because they often occur in relatively restrcited areas. It is not possible, for example, to recommend a minor element supplement ideally suited for feeding in Oregon, although it is possible to suggest several that will work in specific localities within the state. Areas subjected to unusual drainage conditions may be minor element problem areas. Coastal tidelands which are saturated much of the time and reclaimed lake beds are often examples of this type of problem situation.

There are at least three ways in which minor element problems may arise in cattle feeding:

1. Simple deficiency occurs when the supply of some essential element in the feed is not large enough to meet the animal's requirements.

2. Induced deficiency takes place where feed supplies may be adequate, quantity-wise, but are not available to animals due to some other interfering factor.

3. Toxicity occurs where a minor element is present in much greater quantities than needed by the animals.

Some examples may serve to illustrate these situations, From the point of view of simple deficiency, the cobalt content of forages in various areas may run anywhere from 0.01 to 1.00 ppm. At the lower level of this range, the feed is markedly deficient as far as the animal needs are concerned, and cattle grazing such forage will show definite signs of sickness popularly called "salt sick" or "coast disease". Animals so affected become extremely thin and anemic and lose their appetites even when feed is available to them. The critical level of cobalt in forages, above which animals will remain healthy and below which they will become sick, is generally accepted to be about 0.07 ppm, although there are some variations from this. Since this is a simple deficiency, feeding of cobalt either directly to the animal or by increasing forage levels through fertilization is effective in curing it. During the last few years a new type of administration, the "cobalt bullet" has been developed. This is a heavy pill that is designed to stay in the forestomach of cattle (or sheep) and slowly give off cobalt by dissolution over a long period of time.

Copper definiency aay be a simple situation, like that described for cobalt, or it may be induced by interference by another trace element, molybdenum. In the former case, problem forages usually contain less than 3 ppm of copper, but in the latter they may contain 4-8 ppm copper or even more, but also contain over 5 ppm of moylbdenum. It appears that this molybdenum interferes with utilization of copper and

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creates an artificial or induced copper deficiency. One of the most reliable symptoms of such a situation is an extreme and persistent scouring or diarrhea in affected animals. Coat colors are lightened. Hereford animals, normally red-brown may turn almost a canary yellow, while Angus cattle will become a light grayish-white or "pepper and salt" color. Again, since the basic cause is a deficiency, supplementary copper is the cure, and this may be given by drench, in a mineralized salt mixture, or applied to pasture forage as a top-dressing, mixed with fertilizer.

Toxicity also a problem

The problem of toxicity is the reverse of deficiency, and with minor elements the amount necessary to cause trouble may be quite small, Fluorine may be used to illustrate toxicity of a minor element. Unlike the copper and cobalt situations, which may be quite old in origin, the fluorine problem is largely recent and is man-made. Several heavy industrial processes in this country use fluorspar as a flux in the smelting of minerals, and unless stringent precautions are taken, fluorine gas may escape in smoke to contaminate forage in nearby areas. Excessive fluorine in animal diet may interfere with production of milk, reproduction in animals of breeding age, and with bone growth in the young. Danger signs are frequently shown in incisor teeth which show pitting and staining of the enamel, and in advanced cases softening and excessive wear. Another different example of fluorine toxicity has occurred where raw rock phosphates have been fed, without processing, to animals as a source of needed phosphorus. Such materials are usually high in fluorine and the symptoms of fluorosis already described will follow their use. These materials may be made safe by heating to high temperatures, and "defluorinated rock phosphates" are quite widely used.

Many other examples of minor element problems in beef cattle feeding could be cited, and the fact that these elements may be interrelated metabolically in the animal makes the picture even more complicated. Truly, these so-called minor elements are of major nutritional importance. Research in this field has been productive, and encouragement for the future may be found in the demonstration that poor soils and poor plants may be improved to the point where they are satisfactory for the support of animal production at accepted levels.

Challenge and Responsibility of the Registered Breeder to the Beef Cattle Industry

Paul O. Stratton

The purebred-beef business has long been established and looked upon as the heart of the beef industry. Individually and collectively, the registered breeder is charged with the responsibility of producing superior germplasm for the development of the industry. Their product and policy have been cussed and discussed in beef-cattle circles with frequency second only to the weather.

Sometimes the businsss is thought of as a rich man's game. Seldom does the registered breeder claim this honor, although the industry probably does have a higher percentage of gentleman farmers than other segments of agriculture. Frequently, however, I believe it is true that many registered breeders maintain a sizable commercial herd to increase income. This point is not true in all cases, but the fact that it does exist raises a question of concern regarding the direction and existence of purebred herds.

Until recently, the responsibilities of the purebred breeder have been guided by a few key men in the industry and breed association. Standards have been established by these few and with advertising and by the livestock show medium have set the pattern for commercial production. Pedigree worship and showring points have changed very little in the last 25 to 30 years. There have been small changes, such as the trend toward the smaller type of "comprests" and "compacts," of some 10 years ago, but a quick reverse to "middle of the road" cattle has been evident more recently. Today there is a demand for "clean" cattle, but the finepoints system still prevails in the showring. Dr. E. J. Warwick, in his summary of 50 years' progress in beef cattle, reports that changes of type have been effective but "the evidence is less clear that the cattle available today are inherently more productive than those of our grandfathers."

Housewife influential

Recently there have been many progressive changes in the industry. What has been the main cause for this change? To me, the demands of the housewife have been most influential. Today, she makes it plain that she wants beef tender, flavorful, free from excess fat, and competitively priced. What does this mean to the cattleman and, more specifically, to the registered breeder? It means that, if he is to hold his position in the industry, he must produce what the commercial man needs, to produce what Mrs. Homemaker wants, and at a price she can afford. The responsibility remains with the registered breeder to produce superior germplasm, which by necessity must be selected to the best of his ability to produce the product in demand.

The first major challenge to the purebred industry is to meet and maintain the responsibility of producing the product in demand. The direction of the industry is slowly slipping from the control of the purebred breeders. If they do not make progressive changes and meet industry demands, they will lose entirely their responsibility of direction. Organizations such as Performance Registry International as state performance associations are meeting this challenge and will soon take the

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directing leadership at the rate they are moving. Some breed associations have established their own standards of productivity and performance in an attempt to keep abreast with their responsibility; others are truly dragging their feet. Many will defend their function and say we do not need a change, having maintained leadership these many years without such standards of merit. To those gentlemen I say, they should not oppose changes merely because of encroachment on areas they have considered their own. They should evaluate their programs to be sure they have not invited others to enter through failure to provide the service needed. Certainly this group has a right to protest, but only when they themselves can do the job better or more efficiently than others. To do the job better, it must be with action and productivity and not with words of propaganda and advertising.

The second major challenge is competition. This challenge is very broad and includes competition for the consumer's dollar, subdivided first for food, second for meat, and finally for red meat. Although beef is well established as the American choice of red meat, there is always need for work to maintain such leadership. Closer at hand, however, is competition for breeding stock, systems of mating, and sales. Consideration of these factors and decisions about each rest with the individual breeder, but thought should be given to joining forces vs opposing forces within each category. More specifically, these competitive forces are: (1) artificial insemination, (2) cross-breeding, and (3) central performance testing and sales. I would like to discuss each separately, but not necessarily in order of importance.

The use of artificial insemination in commercial beef cattle in the last few years has spread throughout the U.S. and Canada. To date, there are several well-organized associations moving ahead rapidly to a stage which will very shortly have a tremendous impact in the beef industry. Time could be spent discussing the pros and cons of artificial insemination, but talk will not depress this future impact. Artificial insemination is here to stay, and the purebred industry can ill afford to pass it lightly.

Dairy cattle bred artifically

Approximately 35% of the dairy cattle in the United States are bred artifically. In several of the highly specialized dairy countries of the world the figure is considerably higher (Denmark 100%, Japan 93%, Holland 65%). Comparable estimates for beef are about 1%; however, the figures cited verfiy the success of the practice. The volume of beef insemination has doubled in the past year in herds ranging in size of from 5,000 head to 10 and 20-cow herds. Most significant, however, is the fact that the majority of commercial cattlemen who started artificial breeding are staying with it. A breeder in Canada has bred his commerical Hereford of about 1,200 cows for the fourth successive year. Also, there are many purebred breeders that are entirely on an artificial insemination program to date. This type of program, no doubt, reduces the available market for registered bulls, especially when one considers the number of calves produced by any one sire. As an example, there is a polled Hereford bull living who has sired 180,000 calves. The impact on the registered breeder comes from two directions: first, a reduction in demand for herd sires and, second, and increased demand for top-performing, progeny-tested sires for artificial insemination centers.

Cost figures for an artificial insemination program are today comparable to bull costs per calf especially if the bull purchase is inventoried at $750 to $1,000.

As the program enlarges, research in the synchronization of estrus in beef cattle is rapidly progressing. We have had good results at Wyoming in a pilot study on this problem using orally fed progesterone. In the future, it may be possible to bring a large cow herd into heat over a 2-4 day period and settle the entire herd by artificial insemination in this short period; the result---a uniform calf-crop within the same week and by a few performance and progeny-proven sires.

The acceptance of crossbred progeny for the beef market by both feeder and packer has already increased the number of crossbreeding programs initiated by the commercial beef producer. The reason is simple; he no longer finds himself taking a few cents less for crossbreds but often can bargain in the opposite direction in addition to the realized increase in productivity through hydrid vigor. Many purebred associations use crossbreeding as a promotion tool, while others are reluctant to cross hte sacred breed barrier. The packer prejudice, having been broken, has opened the door for a continued increase in crossbreeding for market production. So long as the program is sound and not just promiscuous diddling, it is here to stay. This does not reduce the sale for registered bulls, but opens more markets for top sires of all breeds. A breeding program is only as productive as its components, within breed or among breeds and with or without papers. Competition for unit productivity will continue to force producers into the most productive program.

Testing has gained

The third competitive force, central performance testing and subsequent sales, has gained tremendous momentum this past yerr. More and more prospective sires are being sold in competition with feed bunkmates on their individual merit of conformation, feedlot gain, lifetime gain, and feed conversion. Buyers are becoming more and more performance-tested sires are given the true test in the cow herd. This can best be illustrated by the average price increase realized this past season and by progressive yearly increases at sales of this sort. I am a firm believer that the maximum merit of performance testing will come from within any one herd rather than from central testing. However, central testing and subsequent sales have a great deal to offer, since performance between herds is best measured in this manner. Subsequent sales allow buyers to select breeding stock from competitive bloodlines much as in consignment sales, but on individual merit of performance and not necessarily upon the basis of one judge under pressure on any one particular day.

Agreed, performance testing does not make the individual superior for having gone through such a test. It does, however, allow for greater and more accurate selectivity between individuals that have been tested. The knife will remain one of the best mechanical tools in any breeding program, tested or not tested. However, with records as an added tool, the knife can be used more often and with greater accuracy than heretofore. This competitive force can be met easily and has been by many of the more progressive registered breeders. The success with which such testing and sales are progressing leaves little doubt as to their future.

In summary, there is ample evidence at hand to convince the registered breeders of a need to take a very close look at their industry. If there is doubt of this evidence, I ask only that each breeder follow up at least 50% of the breeding stock he has sold in the last four or five years and observe not only the individuals but also their progeny. These observations would really be eye openers.

How might this small segment of the beef industry strive to retain leadership? Briefly, I suggest the following few, but broad, ideas:

First, develop the livestock show for display of their product, not their product for the show.

Second, meet competition with new and progressive changes. There are many facts and figures to help guide progress in the right direction.

Third, look to new avenues for markets and marketing, but sell a superior product that meets demand.

The challenge will never be greater than it is today, but it can be and will be met with success if all those concerned shoulder the task. The industry has to continually earn the right to be the source of seedstock, or forfeit the right to those who will provide the kind of performing cattle that are demanded.

Dollars and Sense Beef

Walter H. Kennick

Before attempting a sensible appraisal of today's problems in beef, perhaps we should review the recent history of the beef end of the meat business.

Thirty years ago our beef supply was seasonal in both quantity and quality. Thirty-five to 40% of the slaughter steers came to market directly off grass and many of these were 3 to 5 years old when marketed. The balance of the meat supply was made up of dairy cattle, which was generously called dual purpose cattle, and culls from all types of cattle operations. Of course, there were also fed cattle marketed at that time, but here again, there was considerable variation in age at time of marketing. Meat from these extremely variable animals, extending well down into the utility grade, found its way into meat markets and was sold as block beef. The annual per person consumption of beef at that time varied between 45 and 65 pounds.

Now, leaving out abnormal deviations resulting from drouth and wars, what has happened to our beef supply? Seasonal deviations in quantity and quality of meat have narrowed to a marked degree. Aged grass-fat steers have all but disappeared from the market and dairy animals no longer make a large contribution to our block beef supply. In fact, in recent years, the round, loin, rib, and chuck from feed lot cattle have accounted for 75% of the block beef sold in this country. These cattle are also younger and less variable in age, being predominately 16-24 months old at time of slaughter.

Big change to fed beef

Since data on USDA grades of cattle are not available for the earlier periods I have discussed, we can say only that the big change was from unfed (Commercial and down) to fed (Good and up) beef from the early days of the beef industry to post World War II. Since World War II, we have sufficient data to identify the pattern and thereby establish a trend in the grades of beef being marketed.

In 1945, 36% of the steers sold in Chicago graded Prime. Today this figure is about 10%. Choice steers sold on the same market have increased from 42% in 1930 to 60% at the present time. In 1951, when Good steers were first reported separately, they accounted for 17% of the steers sold at Chicago. Now they account for a little over 25% of the steers at the same market. This same pattern has been evident in other Midwest and river markets with slightly varying percentages. From these data it can be seen that the predominant grade of fed steers has worked its way back from Prime to high Good or low Choice beef---in other words, to what we refer to today as "supermarket beef."

I referred earlier to the quantities of beef that were consumed per person when we had a variable beef supply. Now let us see what affect the more consistent supply available today has had on per capita consumption.

Our per capita consumption of beef on a carcass weight basis, has exceeded 80 pounds for 7 consecutive years and at a continuing increase in retail price. Since there is no other single year on record in which the per capita consumption of beef reached 80 pounds, regardless of price, it must be assumed that the consumer is

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relatively pleased with the beef being marketed today. I point this out to illustrate that the picture is not all black by any means. However, I must also hasten to dispel any over optimism. Dr. Harrell Degraff, Babcock professor of Food Economics at Cornell University gave this warning: "Consumer demand is a more perishable potential than is our capacity to produce livestock products. Effective consumer demand is based not alone upon ability to purchase. At least as important is the consumer's desire to purchase. This means that if consumption potentials are to be realized, our products must be good, in the consumer's definition of good. We must see that they are good, and then we must nurture with care the public image of these products."

Based on current grading methods and historic beliefs concerning quality factors in beef, these two factors would appear to be opposed to one another. Fortunately, however, modern research has shown that desirable eating quality is not synonymous with excess fat. Since these two problems have been shown to be practically unrelated in the young beef marketed today, let us look at them separately.

Tenderness heritable

Tenderness in beef has proved to be highly heritable and to be negatively correlated with age. Unfortunately, the high heritability of tenderness is difficult to take advantage of even in a closely controlled scientific breeding program and is impractical in a commercial operation. Uniform youthfulness of today's slaughter cattle is already taking advantage of the negative correlation between age and tenderness. This management practice can be further extended to remove the older end of today's beef supply from the market.

Meat technology also is aiding the beef industry in reducing problems associated with tough meat. Several methods of tenderizing have been developed and are in more or less limited commercial use. One basic principle, with two basic methods of application, is used in most of these methods. One takes advantage of natural enzymes in a high temperature, short-time aging process; the other uses artificial enzymes. Current indications are that technology, assisted by the marketing of more youthful beef, will solve the problem of tenderness in meat more rapidly then selection and breeding.

The problem of fat, wasty beef is also being handled by technology in the form of a butcher closely trimming retail cuts of meat. This, however, is a very costly method of eliminating the waste fat to which the consumer has a growing objection. To understand the costs to the producer of wasty cattle, it must be realized that the price of live cattle paid to the producer ultimately depends on the price consumers are willing to pay for retail cuts of meat, less the yield, cost, and profit figures which separate the producer and the consumer.

The table illustrates differences in values that may be found in the same grades of beef. These differences are not extreme. John C. Pierce, USDA Agriculture Marketing Service, in a study of yield of retail trim cuts from beef carcasses, reports that differences in carcass value of 10 dollars per 100 pounds between individuals within the same grade were not uncommon.

An analysis of the data in Table 1, reveals that a combination of fairly high dressing percent and yield of retail cuts makes animal "A" much more valuable than any of the other three. Animal "B" was a meaty animal but extremely fat as can be

seen by comparing the dressing percent and yield of retail cuts. Animals "C" and "D" were more similar than "A" and "B." Neither "C" or "D" had good muscle development, as shown by the yield of trimmed retail cuts, nor were they excessively finished, as seen from the dressing percentages. The small differences in yield and dressing percent are both in favor of animal "D" and increase its value by $1.18 per 100 pounds live and $1.35 per 100 pounds of carcass when compared to animal "C."

The trend towards marketing younger beef has made the following contributions toward solving our current beef problems:

1. Take advantage of the tenderness associated with youth.

2. Produce fewer overweight cattle.

3. Young cattle produce fewer wasty carcasses (there is a positive correlation between carcass weight and percent of fat in the carcass).

4. Lower grade requirements. One full degree less marbling is required for extremely young beef carcasses than for intermediate age carcasses to qualify for any particulr grade.

Effect of Yield of Retail Cuts on Carcass and Live Value of Beef

	A		B		C		D	
Retail trim cuts	% of carc.	Value/ cwt carc.	% of carc.	Value/ cwt carc.	% of carc.	Value/ cwt carc.	% of carc.	Value/ cwt carc.
Round and rump	19.0	$18.62	15.6	$15.29	17.5	$17.15	16.5	$16.17
Loin	12.4	14.76	10.8	12.85	10.9	12.97	11.3	13.45
Rib	6.0	5.34	4.8	4.27	5.3	4.72	5.0	4.45
Chuck	18.0	10.62	17.1	10.09	18.3	10.80	17.2	11.87
Hamburger and stew meat	23.0	12.65	19.3	10.61	20.2	11.11	22.8	12.54
Total retail cuts	78.4		67.6		72.2		72.8	
Bone, fat, waste and shrink	21.6	.22	32.4	.32	27.8	.28	27.2	.27
Total value at retail		62.21		53.43		57.03		58.75
Less 22% retail cost		13.68		11.75		12.55		12.92
Wholesale value		48.53		41.66		44.48		45.83
Dress %		63.10		66.9		57.5		58.4
Live value		30.62		27.87		25.58		26.76

There are many things still unknown about the factors which contribute to the economic production of beef which will meet the consumer's concept of desirable beef. If we are to maintain the present high consumption of beef at a price agreeable to all phases of the beef industry, well designed research must continue to add to our knowledge and producers must put this knowledge into practice.

Yield and value of retail cuts were calculated from Texas Agricultural Experiment Station data. Texas Agricultural Progress Vol. 7 (2).

Protein Requirements and Supplements for Wintering Range Beef Calves With Meadow Hay

R. J. Raleigh

Most roughage used for wintering beef cattle in eastern Oregon and in many areas of the west is a low quality native meadow hay.

This hay is generally low yielding and is often harvested at near maturity to get maximum yield. Legumes are present in very limited quantity. While the hay is low in crude protein---7 to 9%---it has a gross energy content approximating better quality roughages. Hay harvested past maturity often has protein content as low as 4 or 5%. Cellulose digestibility is low---45 to 50%. This forage is bulky and one of the major problems in feeding this roughage is to get the animals to eat it in sufficient quantity to meet more than their maintenance requirements.

Considerable research shows that increasing protein content of a low protein diet will increase feed intake and gains. Urea and other non-protein substances have been used with varying degrees of success as a protein extender.

Feeding phosphorus fertilized meadow hay increased rate of gain in weaner calves in previous work at the Squaw Butte Experiment Station. This increase was apparently brought about by increased legume content of the hay, rather than by increased phosphorus content. Supplying additional phosphorus with unfertilized meadow hay did not result in increased gains in weaner calves.

Phosphorus fertilization on native flood meadows often results in an increase of annual white-tip clover which substantially improves hay quality. It is accepted that small amounts of legumes provide a stimulatory action in the rumen and bring about increased feed efficiency.

This paper reports results of two experiments which are part of a program to learn how to make more efficient use of meadow hay. The first was a study of the performance of calves wintered on different levels of protein, comparing urea with cottonseed meal as the entire, and as a portion of, the protein supplement. The second study was to determine if alfalfa meal could beneficially replace part of the protein from cottonseed meal, and, if so, what level of alfalfa would bring about the greatest increase in animal performance.

Trial I. Influence of protein level and source on winter performance of range calves.

Experimental Procedure

Thirty yearling steers were stratified by weight into 3 replications of 10 each and randomly allotted to treatments shown in Table 1. Meadow hay was harvested the first week in August to insure a low crude protein content. This resulted in hay with a crude protein content of 5.5%. Cottonseed meal, urea, and a mixture of cottonseed meal and urea were used to bring the crude protein levels of the diet to 6, 9, and 12% as desired. When cottonseed meal and urea were both used in a diet they were supplied in amounts so that one-half the protein equivalent would come from each

source. Salt and monosodium phosphate were mixed in equal parts and made up one percent of each diet. The entire diet was pelleted. The steers were on trial a total of 15 weeks from November 4 to February 17. They were tied to individual feed bunks from 7:00 a.m. to 3:00 p.m. each day and ranged in a common lot the rest of the time.

Results

The steers adjusted to being tied and to the all-pelleted ration. During the fifth week of the trial an animal on the 12% protein diet, made up of hay and urea alone, went off feed and into convulsions, and died. One week later a second animal on this treatment became ill and died within 24 hours after first symptoms appeared. Both animals exhibited symptoms associated with ammonia toxicity. The third animal on this treatment was removed from the trial.

Table 1 shows the average daily gains of the animals. The animals on 9 and 12% protein levels gained significantly more than those on 5.5 and 6.0% protein. There was no significant difference in rate of gain between the 9 and 12% protein animals. Source of protein significantly affected rate of gain at the 9 and 12% protein levels with those animals receiving cottonseed meal alone making greater gains than those receiving urea as all, or part of, the protein supplement. At the 6% protein level source of protein did not significantly effect gain.

Feed intake was essentially the same for all animals at the start of the trial, but as the trial progressed feed intake of those animals receiving higher levels of protein continually increased. Daily feed intake followed the same pattern as daily gains (Table 2). Daily feed intake significantly increased as the protein level increased from 6% to 9 or 12%. The difference in feed intake of the steers on 9 and 12% protein diets were not significantly different. The pattern for feed intake was the same as gain, with respect to sources of protein supplements. However, differences were not of sufficient magnitude to be significant.

Table 1. Experimental design with average daily gain of the three animals on each treatment.

Diet ingredient	Crude protein levels (%)			
	5.5	6.0	9.0	12.0
	lb.	lb.	lb.	lb.
Hay	0.27			1
Hay + Urea		0.39	1.23	
Hay + Cottonseed meal		0.26	1.62	1.83
Hay + Urea and Cottonseed meal		0.41	1.35	1.51
Average	0.27	0.35	1.40	1.67

[1]Two of these animals died and the third was removed from the experiment.

Feed conversion data are presented in Table 3. There was no significant difference in feed efficiency of the steers on the 9 and 12% protein diets, but both of these groups were significantly more efficient than the animals on 5.5 and 6.0% protein diets. Source of protein supplement did not significantly effect feed efficiency regardless of level of protein.

Table 2. Average daily feed intake of steers on each treatment

Diet ingredient	Crude protein levels (%) 5.5	6.0	9.0	12.0
	lbs.	lbs.	lbs.	lbs.
Hay	9.53			1
Hay + Urea		10.10	13.73	
Hay + Cottonseed meal		9.33	15.00	15.33
Hay + Urea and Cottonseed meal		11.03	14.33	14.50
Average	9.53	10.15	14.35	14.92

[1]Two of these animals died and the third was removed from the experiment.

Table 3. Average feed required for 100 pounds gain on each treatment

Diet ingredients	Crude protein levels 5.5	6.0	9.0	12.0
	lbs.	lbs.	lbs.	lbs.
Hay	3,530			1
Hay + Urea		2,590	1,116	
Hay + Cottonseed meal		3,588	926	838
Hay + Urea and Cottonseed meal		2,690	1,061	960
Average	3,530	2,956	1,034	899

[1]Two of these animals died and the third was removed from the experiment.

Cost data for the different treatments are presented in Table 4. This reflects only the cost of feed ingredients and not the cost of processing or operation since this was the same for all lots.

Table 4. Average cost per 100 pounds for steers on each treatment[1]

Diet ingredient	Crude protein levels (%) 5.5	6.0	9.0	12.0
Hay	$35.30			2
Hay + Urea		$26.18	$11.84	
Hay + Cottonseed meal		37.28	11.58	$12.24
Hay + Urea and Cottonseed meal		27.57	12.26	12.34
Average	35.30	30.34	11.89	12.29

[1]Native hay was priced at $20.00, cottonseed meal at $70,00, and urea at $120.00 per ton in arriving at cost figures.

[2]Two of these animals died and the third was removed from the experiment.

Treal II. Low levels of alfalfa in the wintering ration of weaner calves.

Experimental Procedure

Forty weaner calves were stratified by weight, sex, and previous management, and randomly allotted to 4 treatments with 10 animals per lot. Meadow hay was fed free choice and all animals received 2 pounds of rolled barley daily in addition to the protein supplement. The calves were weighed every two weeks and hay consumption was recorded weekly. Salt, bonemeal, and water were available in all lots.

The treatments were calculated so each would have the same total crude protein treatments as follows:

a. One pound of cottonseed meal per head daily.

b. 0.22 pound of cottonseed meal and 2.0 pounds of alfalfa meal per head daily.

c. 0.5 pound of cottonseed meal and 1.33 pounds of alfalfa meal per head daily.

d. 0.75 pound of cottonseed meal and 0.67 pound of alfalfa meal per head daily.

The cottonseed and alfalfa meals were mixed for each treatment and fed daily in feed bunks. Meadow hay was fed daily in hay mangers. The trial was conducted over a 16-week period.

Results

A summary of gain and feed data is presented in Table 5. Average daily gains were 1.38, 1.29, 1.32, and 1.59 pounds for the control, high alfalfa, medium alfalfa, and low alfalfa groups, respectively. These trends were present throughout the trial. The steers receiving the lowest level of alfalfa gained significantly more than the other 3 groups. The differences among the other 3 groups were not large enough to be significant.

Table 5. Summary of gain and feed data

Supplement[1]		Number of calves	Average daily gain	Average daily hay	Feed[2] per cwt gain	Cost[3] per cwt gain
Alfalfa meal	Cottonseed meal					
lbs.	lbs.		lbs.	lbs.	lbs.	
----	1.00	10	1.38	10.6	986	$13.84
2.00	0.22	10	1.29	9.8	1,086	15.55
1.33	0.50	10	1.32	10.0	1,050	15.11
0.67	0.75	10	1.59	10.9	898	12.57
Average			1.40	10.3	1,005	14.27

[1]The daily protein supplement per animal for all lots was calculated to supply total crude protein equivalent of 1 pound of cottonseed meal.

[2]Includes consumption of meadow hay, protein supplement, and barley which was fed at a rate of 2 pounds per head daily in all lots.

[3]Native meadow hay was priced at $20.00, cottonseed meal at $70.00, alfalfa meal at $45.00, and barley at $50.00 per ton in arriving at these figures.

The average daily meadow hay intake was 10.6, 9.8, 10.0, and 10.9 pounds for the control, high alfalfa, medium alfalfa, and low alfalfa groups, respectively. This relationship of low meadow hay intake and high alfalfa level existed throughout the trial, but was not of sufficient size to be significant. Costs of gain include only cost of feed ingredients and not cost of management since these were the same for all lots.

Summary and Conclusions

Native meadow hay containing 5.5 or 6.0% crude protein was not adequate to produce satisfactory gains in weaner calves. However, supplementing this hay so the ration contains 9 or 12% crude protein increased gains to a level that is desirable for growing animals. The gains, and the difference in gains, of animals receiving the 9 and 12% diets would probably have been greater if additional energy had been provided.

Cottonseed meal was a more efficient source of protein than urea fed alone or in combination with cottonseed meal. This was not expected since the level of urea fed with cottonseed meal was within the recommended allowance, and gains comparable to those made from cottonseed meal alone should have occurred. However, the level of urea, when fed on the sole protein supplement, was higher than that generally recommended. Lack of additional energy may be the limited factor here. The energy requirement of an animal increases as dietary protein increases if the animal is to make efficient use of the protein. If the energy-protein ration is low some of the protein is used for energy. While protein is not an efficient or economical source of energy the animal is able to use it to balance the energy-protein ration requirement of the body. In treatments where the crude protein supplement was composed of half urea the energy available from the supplement would be considerably less than that from an all cottonseed meal supplement, and in the treatment where urea provided all the protein supplement there would be practically no energy available from the supplement.

This work shows that supplementation to bring the ration up to about 9% crude protein will provide satisfactory and economical gains. In order to push gains beyond this point additional energy as well as protein should be provided. Urea can be used as a protein extender, or supplement, if it does not supply over half of the supplemental protein, but care should be taken to balance the ration for energy.

Weaner calves fed a small amount of alfalfa hay increased in gains over those receiving no alfalfa or higher levels of alfalfa. This alfalfa was fed as a meal with the cottonseed supplement. The small amount of alfalfa apparently provided the stimulatory action of legumes without inhibiting total feed intake. The alfalfa fed in larger amounts may have inhibited meadow consumption of the animals. This phenomena might not have occurred had the alfalfa been fed with the meadow hay rather than with a concentrate protein of the ration.

Diseases of the Bovine Eye

L. M. Koger, D.V.M.

Of all the many diseases that plague the cattle industry perhaps the most common complaint is of eye troubles. In a recent survey of beef cattlemen that was edited at Washington State University, requests for research on "pink eye" headed the list.

Although occasionally there is eye involvement in a number of diseases, eye troubles fall roughly into three groups: Infectious inflammations of the eye, foreign objects under the eyelids, and malignancies of the eye.

Infectious inflammations of the Eye

"Pink eye" infections confront the cattlemen more often than the other eye problems. Research scientists have found a number of organisms involved in eye infections, but have not as yet discovered a common contributing etiology. Hence it is not surprising that efforts to produce an immunizing vaccine have not been entirely satisfactory. That is not to say that bacterins now in use do not help to raise an animal's resistance to eye infections, but rather to point out that results are varialbe.

Symptoms usually begin with excess lacrimation, wetting the hair below the eye. Closer inspection will reveal an engorgement of the vessels of the surface of the eye, and an appearance of general inflammation. Treatment with one of the numerous preparations on the market may arrest the condition at this stage.

If not, an ulcer usually forms on the clear surface of the cornea. Then in order to heal the damaged area, nature forms a red area of small blood vessels which surround the ulcer and provide circulation to heal it. In a few cases the ulcer will resist healing, and cautery and systemic treatment will be necessary to overcome it, but generally healing will proceed slowly leaving a white spot of scar tissue where the crater of the ulcer sloughed. If untreated some of the severe cases will perforate into the inner tissues of the eye and result in blindness. How seldom this takes place is remarkable in view of the severity of the inflammation. Blindness also results in a few milder cases where scar tissue obscures the cornea.

As the years have gone by and eye troubles have seemingly increased, it is surprising how many have responded to Vitamin A supplementation. Happily enough the cost of Vitamin A has come down to such a low figure that the cattleman cannot afford to neglect its use wherever a possibility of need exists. Workers at the University of Illinois recommend a supplement of Vitamin A wherever corn ensilage is fed, as they have demonstrated an interference with the transition of carotene into Vitamin A. Dry pastures and damaged or old hay are often deficient in Vitamin A.

Some cattlemen report that insecticide spraying for lice will stop the spread of pink eye through calves. It may be that skin parasites can spread it. It is doubtful that the insecticide itself could be a factor.

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Ringworm lesions about the eyes seem to contribute to eye inflammations, and should be controlled. Fortunately we now have nonirritating antiseptic chemicals that can be added to insecticide sprays and are effective.

Foreign objects

A bovine animal's habits of feeding predispose them to eye injury and the accidental introduction of foreign objects under the eyelids. Oat hulls or similarly shaped pieces of plant fiber adhere to the eye itself and may be difficult to remove. A piece of dry sterile cotton held on the tip of the finger however, will usually wipe it off easily. Grass awns and beards tend to work under the lids and unless removed may penetrate and form an abscess.

When conditions are just right, a number of animals may be affected and owners often believe an infectious condition is spreading through the herd. Therefore foreign objects should be eliminated in diagnosing any herd condition as well as an occasional individual in outbreaks of infectious "pink eye." Good restraint and a good look under the eyelids are necessary to be sure that an awn is not the cause of trouble. Usually a corresponding area of inflammation on the eyeball will point out the location of trouble.

Cancer eye

If there were figures available on the losses due to this malady in Oregon, I suspect that the bankers would rise and demand action. At any rate the loss is tremendous and apparently is increasing. It may and does occur in all breeds of cattle, but is most common in white faced cattle with unpigmented eyelids. Although the opinion is sometimes stated that pink eye infections contribute to "cancer eye" because it is often difficult to distinguish between them, it is more likely that the reverse is true and the severe inflammation of pink eye tend to prevent the growth of malignant tissues. Malignancies seem to require a long period of mild irritation to establish themselves. Evidence indicates that sun glare is a factor. The incidence of cancer in the eye with unpigmented white eyelids is many times greater than in those that are pigmented. Therefore the desirable characteristic of pigmented eyelids should be considered in the selection of breeding stock.

For the present and near future, a program of salvage of early cancer cases is imperative. If the lesion is confined to its original location and the animal is not emaciated, meat inspection regulations usually permit slaughter. As soon as the growth can be recognized as malignant, the animal should be culled at the earliest economical time, since the cancer sometimes will flare up very rapidly. For many years, veterinarians have performed enucleations of affected eyes. It is usually successful and after the wound has healed the cow will ordinarily bring her true value on the market.

In recent years early growths have been removed by several means. Surgery and radiation devices have been used. High frequency electro-cautery has permitted the destruction of extensive growth on the eyeball with satisfactory healing and resultant normal sight. This has permitted more latitude in the salvage of animals as they can be observed more carefully for reoccurrence or other growths. But it appears that it is just a matter of time until other growths do appear.

In the past many cattlemen have felt that cancer eye was an affliction of old cows, and according to Russell, et al., "Studies on Bovine Ocular Squamous Carcinoma," Cancer, (1956) the peak incidence is at 8 years of age. However, many cases are now observed in animals as young as 2 to 3 years. Experience has shown that regardless of circumstances, it is advisable to cull the animal at the earliest economical time for the reasons discussed above.

An animal must have good eyesight to perform its intended functions normally. The disorders that can effect the eyes of cattle constitute a hazard and a challenge to good management.

Impact of High Concentrate Rations on Beef Production

D. C. Church

Current interest in use of heavy concentrate feeding for finishing slaughter cattle in the western states has had a considerable amount of publicity in the past 2 years. The result is that most commercial feeders have tried all-concentrate rations or have increased the percentage of concentrate in their fattening rations. This has occurred partly because roughages have been at retatively high prices in relation to concentrates. Currently, many commercial feeders in a number of lots in California and Oregon are using finishing rations that will run from 75 to 90% + concentrates, although the exact amounts fed will vary considerably from feedlot to feedlot.

The all-barley or, more accurately, all-concentrate rations in which barely is the major item, are not much different from mixtures that have been fed in the corn belt for a number of years. For example, feeders in the mid-western states where corn is readily available have been using corn-and-cob meal with very little or no added roughage for some time. In terms of fiber content, corn-and-cob meal will average about 8% compared to about 6% for barely, and on this basis there is no great difference between these two feeds.

The use of all-concentrate or high percentages of concentrates in finishing rations poses a number of questions concerned with feed utilization, animal health, and carcass quality which will be commented on briefly:

1. Available information shows that the 6% fiber in barley is approaching the minimum that cattle can handle, although no exact evaluation is available. The physical nature of the fiber is a critical factor in addition to the quantity. It has been demonstrated that cattle do not do well on all concentrate rations when barley in such rations is finely ground. The obvious conclusion, since dry rolling and steamrolling do not drastically differ in terms of animal gain, is that hull size is a most important factor in maintaining cattle on feed and in good health. Research data on various roughages has shown that finely ground roughages pass through the digestive tract much more rapidly than do coarsely ground particles. The obvious conclusion is that since rolled barley hulls are relatively large, they are held in the rumen longer than ground hulls--resulting in a more normal retention of feed and allowing for more normal fermentation. Rapid passage of ground feeds through the digestive tract and the accompaning changes in rumen fermentation appear to be the reasons cattle must have more roughage in their ration when concentrates are finely ground. The favorable mention of beef pulp in all-concentrate rations is probably due in large part to this size factor.

2. Early information on supplements have indicated that a large amount of a complicated supplement was required. Recent research demonstrates that a variety of supplements are satisfactory. Most supplements contain some alfalfa meal. This is recommended because of known presence of factors which stimulate the activity of rumen micro-organisms. Trace minerals may be lacking and alfalfa as well as molasses are both good sources for some of these. Vitamin A is one of the nutrients that must be supplied on all-concentrate rations since both grains and protein supplements lack adequate amounts of this nutrient. Just how much is required remains in question, but various reports indicate increased gains when levels up to 30,000 I. U. per

head per day have been fed. Quantity of protein required also remains in question. Most research data indicates that 10 to 11% total protein is sufficient for maximum performance of cattle on standard finishing rations, depending somewhat on age and condition. It is possible that cattle are being overfed protein when 2 lb. of a 40% supplement or an equivalent amount is given daily.

3. In a number of instances, commercial feeders have had difficulty with off-feed, stiff, or foundered cattle. In addition, when cattle are put on heavy concentrate feed rapidly, scours are usually a problem for a time. Cattle that are off feed for any period of time can represent substantial losses. Stiff cattle probably do not do as well as normal animals, and certainly badly foundered ones are handicapped. All of these problems are related to high grain intakes---and the incidence usually goes up as the grain intake goes up. Practical experience shows that all-concentrate rations must be readily available at all times to prevent these disturbances since cattle prefer to eat such feeds often and lightly.

4. Field trials conducted by the University of California in commercial feedlots have resulted in 0.1 to 0.15 pound per day increase in gain when conventional rations containing about 80% grain are increased to 90% plus, and that feed conversion may be expected to improve from about 8.3-8.7 to 7.3-7.5 depending upon other factors involved. Trials completed at the Eastern Oregon Experiment Station on more limited numbers agree in general with these results. Improvement in cost of gain will depend on relative feed prices, feed conversion, and health and performance of the cattle.

5. Most of the information available would indicate that high concentrate-fed cattle will yield slightly more than comparable cattle fed larger quantities of roughage, although the trend has not always been consistent. The data available on carcasses of such cattle show that not much improvement in grade occurs when the percentage of concentrate is increased above 85%.

General comments: Most cattle fed on all-concentrate or high-concentrate rations have been yearling cattle fed for short periods of time. Such cattle probably are better suited to this type of feeding than are calves. This is especially true because the primary objective is to finish cattle. Calves would be expected to grow and finish and a feeder can probably do this cheaper on larger amounts of roughage. In view of the information at hand, this type of feeding probably would be suited to shorter feeds than 150-180 days, that the incidence of stiff and foundered or off-feed cattle would normally be less and that the maximum gains are to be expected when the duration is of a shorter period---but evidence is not yet at hand to prove these opinions.

Occasionally people are heard to comment that cattle should be expected to be as efficient as hogs on all-concentrate rations. This is a view I do not accept. To the best of my knowledge, no one has been able to maintain cattle in good health and growing rapidly by proving a diet that does not enter and stay for some period of time in the rumen. Due to the nature of microbial fermentation and due to differences in body metabolism between ruminants and other simple-stomached animals we can never expect ruminants to be as efficient as hogs. Some of the all-concentrate diets are quite comparable to hog rations, yet feed conversion is approximately double what it is in the growing pig. Part of this difference is due to differences in relative physiological age. As a rule the younger animal is more efficient, but other differences are due to the wasteful nature of microbial fermentation and the inefficiency with which some of the acids formed in the rumen are used by the cattle.

A feeding trial involving a limited number of animals is currently underway. It will be terminated approximately June 1. This trial was designed to evaluate differences in animal perfromance of cattle fed different amounts of barley, and differences when cattle were fed high-concentrate rations for different periods of time.