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Summary of Reports . . .

BEEF CATTLE DAY

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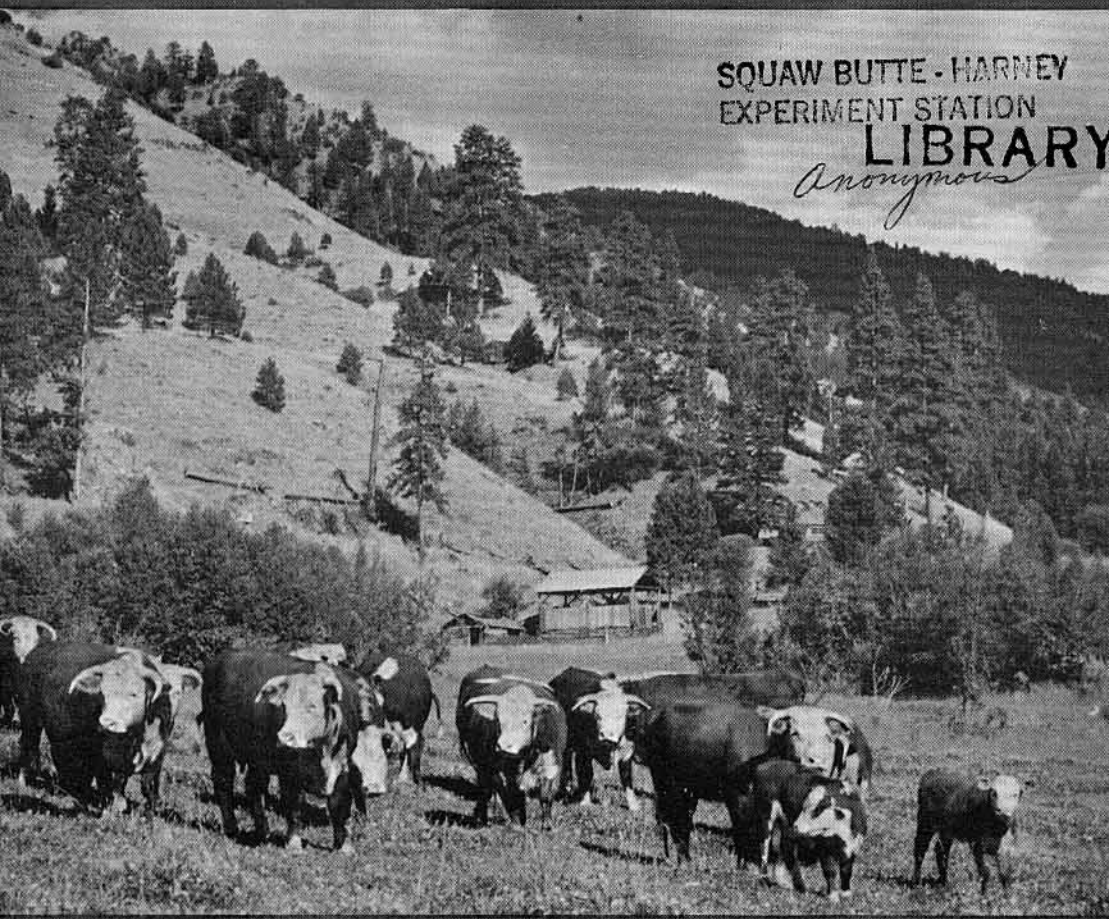

AGRICULTURAL EXPERIMENT STATION . . . OREGON STATE COLLEGE

Corvallis

Miscellaneous Paper 92

May 18, 1960

Foreword

Rising production costs, increasing competition for the consumer food dollar, growing tonnage of beef imports and the impact of consumer preference on meat merchandizing are problems of major concern to cattlemen everywhere. They all point in the same direction and add up to the same requirement, namely: GREATER EFFICIENCY IN PRODUCING WHAT THE CONSUMER WANTS.

This is a challenge to the industry as well as to the individual producer. It will require improvement of present practices, adoption of new ideas and keeping abreast of our rapidly changing industry and its problems. No longer can cattlemen afford the luxury of an 80% calf crop, a 300 pound weaner or a 500 pound yearling. Neither can he afford to use a bull about which he knows nothing other than what meets the eye, nor can he afford to ignore the tools given him by research. Experimental evidence when available must be substituted for opinions, traditions and prejudice. The lag between the findings of research and their application must be shortened.

A noted educator has said "The future belongs to those who prepare for it". In view of the rate of change we have witnessed in agriculture during the past two decades, we cannot take that statement lightly.

This bulletin contains a condensation of talks by our guest speakers, and a summary of the year's research work in areas related to beef cattle. Only work having application value is included. Obviously much basic or fundamental research has preceded some of the applied studies. This is especially true in ruminant nutrition, biochemistry and physiology of growth and metabolism, and genetic principles underlying breeding systems. Basic studies are reported in technical bulletins and journals.

We are grateful to all who have had a part on this program, and to those who have contributed material for this publication.

The Staff of the Department of Dairy and Animal Husbandry is proud to co-sponsor this program with the Western Oregon Livestock Association.

J. C. MILLER, Head
Dairy and Animal Husbandry

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Oregon Cattle Feeding Outlook

Marion Thomas

Oregon cattle and feed raisers are located near the fastest-growing group of highly-paid beef-eaters in the world. What's more, Oregon has resources to produce and market good beef efficiently.

This highly favorable combination of circumstances will not make millionaires out of everyone who may choose to set up a cattle ranch or feedlot in Oregon. It does not even mean that anyone will derive satisfactory returns at all times; but these circumstances do greatly enhance chances for financial reward to those who achieve at least average skill in mobilizing capital and in combining resources required to produce beef efficiently and in volume.

Most of our beef consumers live in California, Oregon and Washington, where their number has grown more than one-third in the past decade and is expected to gain nearly as fast in the next ten years. Their per capita incomes have increased rapidly and are well above the average. These people like good tender, flavorful beef and are willing to pay money to get it. To provide what they prefer usually requires that cattle spend some time in the feedlot.

Most observers feel that to be truly efficient and successful today a feedlot needs to be set up to operate on a year-round basis and handle relatively large amounts of livestock and feed. Often this means several farmers need to combine their cattle and feed resources in order to achieve an efficient operation. Small farm or ranch feeding operations tend to give rather low returns to the operator for his time. However, cattle feeding can add to incomes where labor would otherwise be unused.

Oregon has the resources for feeding cattle. The supply of cattle available for feeding in Oregon is large. More than 600,000 head of calves are now born in the state each year. That is 50% more than 10 years ago. More than two-thirds of the calves are from beef cows. Probably less than one-sixth of Oregon's calves ever see the inside of an Oregon feedlot. Those not fed or slaughtered here go to other states, mostly as weaners or yearlings. A fifth or more move to California.

Besides calves and yearlings, Oregon cattle herds yield each year around 75,000 head of cows that have served their time on farms and ranches. Few of these see feedlots but a little feeding often considerably enhances their meat quality and value.

While Oregon is now producing more calves than ever before, there is much evidence that the number can be increased still further by rangeland improvement, shifting land and feed from other uses, supplemental feeding, and other methods as economic conditions warrant.

The supply of grain available for feeding cattle and other animals in Oregon in recent years has been record large. Current production, plus the combined carryover of barley, oats and corn at the beginning of each of the past four feeding seasons, has exceeded a million tons. This is nearly twice as much as the average during the first half of the 1950's. Production and supplies of these grains probably will continue near this level for the foreseeable future unless farm programs affecting grains are changed radically.

Wheat is not counted in current feed grain supplies, but it could be

available for feeding in substantial amounts if federal legislation were changed to permit pricing at feed levels.

Oregon's home-grown supply of feed grain is readily supplemented by large quantities in Washington and Idaho. Within reach, but at greater cost than in areas where they are produced, are Midwest corn, Southwest milo, and Canadian screenings. Not produced in Oregon but available at added costs of transportation and handling are Midwest and California protein feeds and other concentrates.

Oregon's supply of hay has not increased like feed grain; but several areas of the state have great capacity to produce hay and substitute forages, such as peavine, corn or grass silage, when production and economic conditions are favorable. Hay, grass silage and field corn are currently much more attractive to Willamette Valley grain and seed producers than they were a few years ago. Unless methods of controlling yield-reducing virus on grains are found, considerable western Oregon cropland is likely to shift into corn and forage production in the next few years. Likewise, lower prices of barley, alsike clover and other crops are now making hay more attractive in other parts of the state.

Also bearing on the availability of hay are modern compacting methods, such as pelleting and wafering, which make movement of hay into and out of production areas much more feasible than in the past. The full implication of these processes to Oregon agriculture and cattle feeding is difficult to evaluate. Nevertheless, forage will probably not be a major factor limiting livestock feeding in Oregon over the long pull, although periods of shortages and high prices may slow development and even cause temporary retrenchment.

There is no shortage of manpower needed to feed cattle. Know-how is more of a limiting factor since relatively few have had experience with this type of operation. This may be an advantage to the extent that obsolete methods do not have to be "unlearned".

Know-how is rapidly being acquired by those engaging in feeding operations and by research workers. This know-how is being made available to all interested by county extension agents, feed companies, marketing agencies, the farm press and others.

Especially needed by the cattle feeder is know-how in making decisions about when, where and how to buy and sell the resources he requires and produces in the feeding operation. Oregon has education and market information services aimed to help provide this know-how.

Capital in relatively large amounts is required in cattle feeding. It is available when the necessary terms can be met. Some have been reluctant to put capital into the cattle feeding venture because of its reputation for substantial short-term risk. This has slowed growth in the state; but this reluctance should gradually give way as opportunities are recognized and as experience builds confidence.

Oregon has marketing facilities to move products to feedlots and to consumers in forms and at the times wanted. These include highways and trucks; railroad and cattle cars; country buyers, auctions, and terminal markets; inspectors and graders; slaughtering and packing plants; wholesalers and retailers; crop and market information reporters; bankers and others necessary to perform the numerous services required. Resources are available to supply additional facilities and services as needed and to improve upon those now available.

Oregon feeders and marketing agencies are also developing arrangements and agreements that reduce risks and add stability to supply and price, and help to get supplies to consumers the way they want them when they are wanted.

But remember, this highly favorable combination of resources and facilities by no means assures success for everyone who may choose to try cattle feeding in Oregon. Perhaps unfortunately for Oregon producers and marketing agencies, but fortunately for meat-eating consumers, this state is not the only place with resources for producing beef; but the combination of resources and nearness to market has already rewarded some in Oregon. More will be rewarded in the future if they make the right moves at the right time.

The challenge to the Oregon industry is to learn how to combine its resources more efficiently than elsewhere and to move rapidly toward providing the kind of meat and other products for which consumers are willing to spend their dollars.

In cattle feeding, as in all other endeavors, early application of cost-cutting income-boosting methods will continue essential to financial success. Research such as reported here today aims to provide these tools. They are all-important to competition and improvement of our material well-being. They bring initial benefits to producers in the form of increased income. Subsequent benefits go to consumers in the form of more, better, and cheaper beef. Truly, there are opportunities, as well as problems, in cattle feeding and cattle raising in Oregon today.

Our Changing Cattle Industry

C. W. McMillan

Adapting yesterday and today's cattle business to the needs of tomorrow is the beef industry's biggest chore--and the biggest challenge it has ever faced!

In accepting this challenge, we must recognize competition between meats--and between beef and other demands on the consumer's dollar--will be with us always. We must recognize also that no area, no style of production or feeding, is immune to the very real competition from other procedures or regional shifts. We cannot even guess at the competition which may develop from imported meats as the rest of the world advances in technology and levels of production.

We cannot moan about competition. We must recognize it, face it, accept it as a spur to greater effort and to greater use of the knowledge and techniques we now have and are promised in the future. "We ain't farming as good now as we know how" is a very true statement. Certainly reasonable protection from outside forces beyond human control is absolutely necessary, but today's successful stockman spends more time worrying about how to make use of progress than he does about getting more "protection".

Professor Herrell DeGraff of Cornell and the American National's Fact-Finding Committee have just concluded an exhaustive study into trends and factors within the cattle and beef industry. The study came to a basic conclusion which was no surprise to some, but which may have been so simple that it escaped others. That was: "only the cattle producer and feeder can give the public the beef the public wants badly enough to continue 'demanding' it in increasing quantities".

Although increasing efforts will be made in tenderizing, flavor addition and trim at the packer and retail level, the basic animal can be produced and fed only by men and by the machines controlled by man.

The public gives every indication of increasing its effective demand to just under 100 pounds per capita within the next decade. This will be nearly half again the long-term average and nearly one-fourth more than the current level of consumption which was thought impossible just a few years ago.

This demand did not come because cattlemen sat back and ignored progress while complaining about competition!

It is the cattle industry's own responsibility to keep tab on public wants and likes--no one else has the same interest or desire to assume the responsibility. We must assess and reassess all known information on consumer preference, we must learn about and keep abreast of processing and production techniques which could revolutionize the entire industry. And which could cause great dislocation and confusion to stockmen if that "revolution" should come while we are blissfully unaware of the implications of what is on today's drawing board or laboratory.

For instance, successful tenderization at the packer level could result in fantastic new levels of consumer demand. It need not mean--as some have said--the end of the feeder.....unless the feeder loses his market by default through feeding too long and too fat. There is too much of the carcass that

is just plain tough under Mrs. Homemaker's modern, hurried cooking methods--and Mr. America's talents at the barbecue grill. With cattlemen, feeders, packers and retailers working together, we might be able to provide more and more tender steaks, and less and less of the relatively unwanted "less tender" cuts.

And it might make more sense to get 75 cents a pound for all of the 450 pounds of a retail carcass, instead of $1.98 for a few cuts, and hamburger prices for the rest! It certainly would go a long way toward the only obstacle--price--that the public seems to erect against even greater consumption and enjoyment of our product.

We must also remember--in being alert to the future--that what made the cattle industry great was the inventive genius, the progressive attitudes and the constant quest for new horizons which characterized our forefathers.

Perhaps our horizons are different than Grandad's, but we still have the far-away look in our eyes. Whoever thought ten years ago about using atomic energy to wipe out a race of insect pests like the screwworm? This is one of the most dynamic examples of a scientist with an idea, a stockman with the vision, and an industry with the determination to try something radical and new!

Whoever thought just a few years ago about adopting gadgets used in submarine warfare to probe under the hide and find out how much fat the steer was carrying? Whoever thought that a one-man, push-button feed mill would be serving up tasty and nutritious meals for thousands of cattle at a time .....each and every day?

We could go on and on to describe the "horizons" which are already acknowledged and behind us.

The cattle industry is in an odd position. On the one hand it is a romantic link with the past, with the heritage of culture, society and the qualities of hard work and citizenship which made our nation great.

On the other hand it is the most exciting, most dynamic, most explosive industry in the world.

Vast new worlds are opened up with the invention of some new electronic gadget.....some new picture-taking missile circling our earth. But in that tomorrow when the first man goes into space orbit, let's not overlook in our excitement the things that are going on to make our earth-bound grasses and animals even better.

After all, who jumped over the moon first?

Seriously, the cattle industry is still the world's largest business, employing more people, using more dollars, and providing more goods than any other single industry. The electronics industry, despite its phenomenal growth, is still small'punkins'compared to raising cows! And this fact we should never overlook.

The providing of beef to a growing, dynamic nation is an exciting challenge. No one here now can predict what kind of cattle we'll be breeding--or how the breeding will be done--or what kind of feed we'll be using 20 years from now. It may be just the same as today, but we can be sure that all other avenues to efficiency and success in pleasing the public will be explored.

Every one of us has said "Now, why didn't I think of that" when someone comes up with an idea. Some of them aren't much good, but often enough, through the cooperation of scientists and visionary and daring cattlemen, we come up with that certain spark, that extra touch which makes us glad to be alive and proud to be cattlemen.

By-Product Feeds for Beef Cattle

A. J. Wood

The primary aim of beef cattle production is provision of highly nutritious animal protein for the human diet. The fact that this protein can be produced in a singularly palatable form always delights me when I am attending a poultryman's meeting. My delight arises because the beef animal is equipped to produce this nutritious and palatable dietary protein on feeds that a modern broiler would refuse to consume.

This unique ability of ruminant animals to consume and ultimately assimilate coarse, fibrous feeds, permits the beef cattle nutritionist to search in many out-of-the-way places for ration ingredients which will produce top quality beef. Such materials as corn cobs, sawdust and even paper can provide a source of energy for beef production. Before describing experimental results to illustrate this point, it is important to examine some of the basic principles involved in designing suitable feeds from by-products.

Animals tend to eat to meet their energy requirements. The primary stimulation to the suckling calf or to the finishing steer is this all-dominant desire to consume sufficient feed. Recent research in all phases of animal feeding indicates that in the past we have rarely provided for this energy need in sufficient amount to permit the animal to express its inborn ability to gain weight. There has been much excitement created recently by reports of gain greater than four pounds per day in feeder cattle offered large amounts of rolled barley. If my memory serves me correctly, corresponding rates of gain were achieved here at your own State College a number of years ago when beef cattle were provided with the necessary nutrient energy in their ration. Rate of gain of a beef animal is determined by the interaction of a whole series of factors.

Firstly, and of prime importance, is that the animal possess the inherent ability to gain. This factor is at present receiving much deserved attention from the animal breeding specialists. Given this inherent ability to gain, the ultimate realization of this potential is largely within the control of the ration. This rate of gain may range from less than 0 to some upper limit yet to be determined. On a balanced ration, the gain is primarily determined by feed intake and energy content of the feed. Each year we have our students carry out an experiment with laboratory rats to demonstrate this nutritional fact. They prepare a well balanced complete ration that is very high in energy. From this basal ration a series of lower energy rations are prepared by adding a non-digestible diluent. Table I shows the result of this year's experiment.

TABLE I: THE EFFECT OF RATION ENERGY SWELL ON THE FEED CONSUMPTION AND GROWTH RATE OF THE LABORATORY RAT

Energy Content of Ration	Feed Consumed Per Rat Per Day	Daily Rate of Gain	Feed Per Pound of Gain
2000	6.0	3.8	1.6
1500	8.0	4.2	1.9
1000	13.0	2.8	3.5
750	15.0	2.3	4.8
500	25.0	0.0	∞

Two basic points are demonstrated. First, the animal attempts to eat sufficient feed to meet energy needs. Notice that when the energy content of the feed is cut in half, the animal doubles its feed intake. This continues until the ration becomes so low in energy that the animal cannot eat sufficient feed to gain in weight. The rats on this ration ate continuously. Much attention is being given at present to this question of maximum capacity of the domestic animals. Results will accumulate slowly since this is a complex field. The laboratory rat is one thing, a growing steer quite another. The basic principles are undoubtedly the same but much research needs to be done before the full picture can be developed.

A few years ago we attempted to measure maximum feed intake on a group of Shorthorn cows, some milking and others dry. Results permitted us to state with fair precision the upper limit of feed intake. More recently, Crampton at Macdonald College, has carried out much more extensive trials in guinea pigs, sheep and cattle designed to obtain similar results.

These experiments show that the amount an animal will consume is largely determined by susceptibility of the feed to digestion and use. Animals eat more high-quality roughage than poor roughage per day because the higher grade is more readily utilized.

Work to date shows beyond question that the end result obtained in feeding beef cattle is primarily controlled by digestive capacity of the animal and the energy content of the feed. In developing new by-product sources of feed the nutritionist must examine:

(a) Composition of the source to determine probable energy content per pound,

(b) Apparent density and physical structure to estimate ability of the animal to consume enough feed to make the gains desired,

(c) Content of protein, vitamins and minerals to determine additions from other sources that are necessary to permit full utilization of energy provided by the by-product under consideration, and

(d) Discover some mechanical means of putting the feed together to permit it to be processed and fed at a level that will produce the desired result at a cost commensurate with the selling price of cattle.

To illustrate the practical application of each of these points, let me cite examples of research which have left the laboratory and have been put into practice.

About eight years ago we were asked to examine possible use for refuse screenings. This commodity is present in relatively large amounts wherever

grain is cleaned to a high quality standard. In Vancouver our terminal elevators produce about 50,000 tons each year. The chemical composition of representative lots from one year of production was determined. This chemical evidence suggested these raw screenings possessed an energy potential that had not been fully exploited. Determinations of apparent density showed a great deal of variation from lot to lot. Some weighed 25 pounds per cubic foot, others weighed as little as 10 pounds per cubic foot.

Incidentally, a mash feed of the type used by dairymen usually weighs about 33 pounds per cubic foot. Physical analysis showed, as expected, that light screenings contained large amounts of chaff. Simple fractionation of the screenings with standard grain cleaning equipment showed that removal of a relatively small amount of this chaff could be achieved with relative ease to yield a product containing 22 pounds per cubic foot. Further study of the fractionated material showed that most of the potential energy was locked up in the hard oats of the thousands of weed seeds present. This indicated that if the material was fed in this form, it would pass through the animal into the droppings yielding little or none of the potential energy to the animal and providing a wonderful way to spread noxious weed seeds around the country. Here then was a mechanical problem to release this potential energy. If this could be solved, the weed seed problem would solve itself. The answer was sought in hammer milling through a 3/64" screen, followed by heating in a standard pellet mill. Trials showed that this treatment completely altered the physical structure, destroyed all of the weed seeds and provided a feed in a form that should be acceptable to animals. Perhaps of greatest importance, the apparent density was increased to 42 pounds per cubic foot. All of this laboratory information suggested that on raw screenings, a steer could eat to the limits of digestive capacity and not be able to consume sufficient energy to make appreciable gains. It also suggested that after processing an animal should be able to make reasonably good use of the processed by-product. Feeding trials confirmed these suppositions. They also proved that despite all of the processing, the fibrous part of the screenings was altered only slightly and as a result, it was necessary to reduce roughage intake to minimal levels so that the animals would consume sufficient processed by-product to produce the gains desired. In other words, it was again demonstrated that you cannot pour a gallon of home brew into three quart bottles. To get it into three quarts you have to distil it and remove the extraneous material of low value and concentrate the portion you desire. This research has a successful conclusion in that we now manufacture about 30,000 tons of this feed each year in Vancouver at a price compatible with the results produced with feeder cattle.

In this example problems of protein level were not involved since the fractionated screenings contained 12 per cent of high quality weed seed proteins. When fed at the full feed level, animals consumed enough of these proteins to meet their requirements.

Addition of protein supplements to the screenings improved feed efficiency slightly but did not increase rate of gain enough to justify their addition on a cost basis.

Other work with materials such as sawdust or used newspapers has shown that even materials such as these can be used when suitably processed and balanced to meet the needs of a beef animal.

As a nutritionist I would like to take all the credit for developing feeds out of such raw materials but unfortunately no modern research scientist can stand alone. In the case of the by-product feeds, the feed manufacturer and the feed equipment manufacturer must receive at least half

the credit. In fact, it is only fair to say that the evolution of the modern feed mixing and pelleting equipment had to occur before the nutritionist could take full advantage of his nutritional knowledge. It has long been known that the animal uses the greatest portion of its feed intake to maintain its housekeeping in working shape. Any small addition above this level will produce rich rewards in the form of weight gain. The greater the amount that an animal can be persuaded to consume above this maintenance need, the more spectacular the gains the animal will make. If a 600 pound steer can consume fourteen pounds of roughage feed per day as its upper limit a whole series of results can be produced depending upon the nature of the fourteen pounds of feed. If it is coarse, poor quality hay, it is doubtful the animal will maintain its body weight. If it is average hay, maintenance or a slight gain might be obtained. If now you remove two pounds of hay and offer only twelve pounds you can persuade the animal to consume four pounds of a by-product pellet, which if suitably formulated, will induce the animal to gain a pound or more per day.

Development of new by-product feeds then demands a detailed knowledge of requirements of the animal, capacity of the animal to consume feed, and the composition and physical structure of the new by-product. It goes without saying that all of this knowledge must be available or sought by competent agricultural scientists. You are fortunate in having all of the necessary prerequisites for new feed developments within your state and at your State College.

The Packers' Interest In Beef Cattle Improvement

R. J. Norrish

The phenomenal development and growth in the techniques of packaging since World War II has exerted a subtle but none-the-less profound influence on uniformity that is being increasingly felt by today's meat producers. As the super markets have grown and brought the prepackaging of meat to the point of ready acceptance by the consumer, the purchasing of meat has moved steadily into specification buying aimed at uniformity of retail cuts. Prior to the heavy emphasis on uniformity in the final package, the packer could find customers for almost any assortment of beef that came to market.

Today, this is an operational luxury which the packer can no longer afford. The packer must meet the demand for uniformity by means that go beyond mere regrouping and grading. The packer must become more selective in obtaining the animals to fill the trade requirements. Accomplishment of this objective requires the combined best efforts of both the producer and packer, based on the research findings of our colleges and individual organizations.

The general objectives of beef cattle research must be to produce beef more economically and to make the product better and more uniform in quality as determined by consumer desires. This economy of production must be related to a complete program of breeding, nutrition and management.

Conformation of beef cattle is also highly important in researching improvement. Cattle must be able to range and convert very low cost feedstuffs into beef. Hogs and chickens will always have an advantage in efficiency of feed conversion, but beef cattle will always be competitive as

long as beef is favored among meats, and an abundant supply of forage is available at reasonable cost.

Consumers want lean, tender, flavorful beef, and prefer certain steaks and roasts among the several cuts available from a carcass. The shape that will provide the highest proportion of meaty, preferred cuts is most sought.

The application of research in all phases of beef production--from ranch breeding to the dinner table--such as is being conducted at Oregon State College, is contributing to the needed improvements today.

Anaplasmosis and Leptospirosis: Two Cattle Disease Problems

Dean H. Smith, D.V.M

Combatting disease problems is a constant and serious problem to the cattleman. The following two discussions highlight two cattle diseases of major importance: anaplasmosis and leptospirosis.

Anaplasmosis

Anaplasmosis is one of the most common diseases of cattle in Oregon. It is endemic in many beef cattle herds east of the Cascades and in some herds in Douglas, Jackson and Josephine counties. The most infected herds have been found in Baker, Wallowa, Malheur, Harney, Lake, and Klamath counties.

Anaplasmosis is primarily a disease affecting the red blood cells. The causative agent appears to enter the cell, grow, multiply, and destroy the cell. It is this red cell destruction that produces the weak, anemic animal seen in clinical cases of anaplasmosis.

Occurrence of the disease in Oregon appears to be closely associated with the tick population, especially the Rocky Mountain spotted fever tick, Dermacentor andersoni. As the ticks become active and numerous in the spring, incidence of clinical cases of anaplasmosis in cattle rises and the disease remains a real problem during the summer and early fall. There are a number of ways anaplasmosis can be transmitted from an infected to a susceptible animal, but the tick appears to be the most important. The disease agent is harbored in the tick and is passed through the ova to the next generation of ticks. The infected young are then capable of passing the infection on to their next host. Many blood-sucking and biting insects are capable of mechanically passing the disease. If they feed on an infected animal and then go directly to feed on a susceptible one,there is a good possibility of tranmission of infection.

Man is frequently the spreader of anaplasmosis. Dirty needles, surgical equipment, dehorners, and so forth, can pass the disease agent readily. Winter outbreaks, when insects are not a problem, have been traced to these sources.

An incubation period of 15 to 45 days follows introduction of infected material. After the first anaplasma bodies appear in red blood cells, they can be observed in more and more cells until they reach a peak in 5 to 10 days. At this time as many as 80% of the red cells may be invaded.

The body temperature goes up when bodies begin to appear in the cells and ordinarily continues to increase as more cells are involved. Milk production may drop when dairy cattle are infected. As anemia develops, the exposed mucous membranes become very pale and often yellowish, indicating icterus. As the shower of anaplasmosis bodies in the red blood cells decreases, the temperature decreases to normal. The affected animal is very weak and exertion is apt to cause death due to lack of oxygen. In some cases urine is blood tinged. These cases may resemble red-water disease or leptospirosis. Anaplasmosis is usually most severe in mature animals.

Laboratory diagnosis can be established by the demonstration of the anaplasma bodies in the red blood cells during the course of the disease, or by a complement-fixation test on the blood serums of affected animals. Many cattle which recover from an attack of anaplasmosis remain carriers for years.

To prevent spread of this disease, inoculation of infected blood into susceptible animals must be eliminated. Control of insect vectors is important, but is difficult, if not impossible in the case of beef animals. Surgical instruments, dehorners, ear-tags, pliers and other tools, should be washed free of blood and disinfected between each use. Clean, sterilized hypodermic and bleeding needles should be used on each animal.

The tetracycline group of antibiotics are effective in treating the disease. Supportive treatment such as blood transfusion and dextrose are of value when they can be used. The difficulty encountered with this treatment is that the animal may become excited during restraint and die of suffocation. This has caused a number of veterinarians to give up supportive treatment on these animals.

Leptospirosis

Leptospirosis in cattle has been receiving a great deal of attention during the past few years. Although there are a large number of species of Leptospira, only one, Leptospira pomona, is of major importance in cattle. This species is responsible for over 95 per cent of the cases reported. The disease may infect a herd in such a mild manner that it is detected only by means of a blood test, or it may be severe and cause a death loss of up to 10 per cent. Abortion is sometimes a symptom of the disease in beef cattle. A 25 per cent abortion rate is not uncommon.

Blood tests have been made at the Oregon State College Veterinary Diagnostic Laboratory since 1953. Over 39,000 tests have been made during this period. The reactor rate is slightly over 3 per cent. This figure is undoubtedly high, as the majority of samples are sent in when the practicing veterinarian suspects trouble. The reactor rate for Oregon as a whole is low when compared with reports from other sections of the country. This is perhaps due, in part, to our low swine population. We know that swine shed greater numbers of the organisms in their urine for a longer period of time than do cattle, and the Leptospira organisms readily pass from swine to susceptible cattle. It is interesting to note that the areas in the United States with high reactor rates in cattle are also major swine producing areas. Reactors have been found in almost every area of the state, but the highest incidence is in the northeastern corner of the state. When blood tests became available, it was found that antibodies to the disease were detectable in blood serums of some animals over widely separated areas. This indicates that Leptospirosis has been with us for a long time.

In Oregon we have found L. pomona antibodies in blood of cattle, swine, humans, horses, deer, dogs, mink, sheep, and rabbits. Investigations from

other areas of the United States have shown them in mice, foxes, bats, opossums, skunks, wildcats, and many other animals and birds. The world-wide distribution and the great number of possible hosts indicate that we will not be rid of the disease soon. This also shows the futility of a test-and-slaughter type of eradication program which has been so successful in the control of brucellosis and tuberculosis.

Recently developed vaccines are proving much more effective in control of this disease than earlier ones. They are prepared from living attenuated strains of L. pomona and give a more rapid protection and immunity that lasts for a longer period of time.

This disease problem must be met at a local level by the cattleman, his veterinarian, and those interested in livestock health. A blanket recommendation for routine vaccination cannot be made at this time. This must be done on an individual herd basis, with all factors pertinent to the individual outbreak considered. These factors include the amount of infection in the area, whether or not additions are made to the herd, type of soil and drainage, and exposure to other animals, especially hogs.

A great deal of research is being conducted on this disease by workers in the fields of public health, veterinary and human medicine.

1960 Steer Feeding Trials

Corvallis

D. C. Church

This is the first year for some time that steers have been fed on an experimental basis at Corvallis. Number of steers involved is relatively small as feeding experiments go, however use of individual feeding facilities should result in more precise information and reduce the number of animals needed per treatment. Completion of the experimental barn and the location of a suitable group of steers delayed the start of the trial, so by May 18, our field day, the steers have been on feed only 109 days, and information presented here will include only 62 days of feeding.

The trials were basically designed to compare high-roughage pellets and wafers with other minor modifications for the first 84 days to learn how steers would respond to the facilities in use.

The following ration was fed:

Alfalfa hay	55.00 %
Grass screenings	10.00
Steamrolled barley	28.25
Soybean oil meal	1.00
Salt, Iodized	0.25
Dicalcium phosphate	0.50
Molasses	5.00
Total	100.00 %

The hay in this mixture was ground through a 1/8" hammer mill screen and the mix made into 3/4" pellets, or the hay was chopped and the mixture made into 4" wafers.

Initially the cattle were allotted to treatments on the basis of weights obtained after an overnight stand without feed or water. They were then placed on one of the following treatments:

Lot No.	Treatment
2	Individually fed, pellets
3	Individually fed, wafers
4	Individually fed, water constantly available, pellets
5	Individually fed, water constantly available, wafers
6	Group-fed, hand-fed 2 x daily, pellets
7	Group-fed, hand-fed 2 x daily, wafers
8	Group-fed, self-fed, pellets
9	Group-fed, self-fed, wafers

The routine experimental procedure will be to feed individually two times daily (Lots 4 and 5) with water available, allowing five to six hours access to feed daily at approximately nine-hour intervals (7 a.m. and 4 p.m.)

Data available at the time this report was written may not be representative of results after a longer feed, but comparisons which would be of interest are given below:

Treatment	Average Daily Gain Pounds	Feed Consumed Per Day Pounds	Feed Per Pound Gain Lb.
Pellets (Lots 2, 4, 6, 8)	2.48	13.7	5.50
vs.			
Wafers (Lots 3, 5, 7, 9)	2.68	16.1(15.7)*	6.02(5.86)*
Stall-fed (Lots 2, 3, 4, 5)	2.40	13.5	5.63
vs.			
Pen-fed (Lots 6, 7, 8, 9)	2.76	16.2	5.90
Hand-fed (Lots 6, 7)	2.69	16.0	5.95
vs.			
Self-fed (Lots 8, 9)	2.84	16.5	5.82

*The data in ( ) exclude feed wastage.

Data available at this point do not warrant drawing any firm conclusions, however several bits of information can be mentioned.

With the type of feeding facilities in use it has been obvious that some cattle are more suitable for individual feeding then others due to differences in temperament. The experimental animals in use were wild and some of them have not yet (62 days) quieted down. The result has been wide variation in performance. However several of these calves fed in groups did poorly, also. The individually-fed calves did not go on feed quite as rapidly as the group-fed steers where they had access to feed bunks all day long. However, differences in gain have been decreasing with time.

In comparing pellets and wafers, the live-weight gains of the wafer-fed cattle have been 0.2 to 0.3 lb. per day ahead of pellet-fed calves to this point. Apparent consumption has been higher on the wafers, although feed wastage has, at times, been considerable. There would appear to be a 10 day to two-week period before the calves learn to eat the wafers. In the process, they tend to back away from the bunks and many wafers are dropped on the

ground. No doubt a redesigned bunk would reduce this wastage. Minimum wastage in the pens (4 head) over a period of three weeks has been as high as 80 lbs. Not all of the feed was picked up before it disintegrated, so the figures obtained are an underestimate. Average wastage per pen for the 62-day period has been 105 lbs.

The two pens (6 and 7) which were hand-fed twice daily have gained slightly less than self-fed pens. The hand-feeding was included only after it was determined that a mechanical feeder could not be installed without delaying the trial further.

At the end of 84 days some of the poor-doers will be culled and all steers then fed as lots 4 and 5 for approximately 120 days or until an individual steer is presumed to have reached the choice grade. If it appears advisable after they have been on feed for a total of 140 to 150 days, some additional grain may be added to the daily feed. Information at hand would indicate that when the grain in pelleted feeds is increased much over 50%, the expected gains from pelleting do not materialize.

Beef Cattle Breeding Research

Ralph Bogart

The beef cattle breeding research program is continuing with three lines of Herefords at Corvallis and one at Union, and one line of Angus at Corvallis.

The 1959 calf crop has been individually fed to obtain data on rate and efficiency of gains. The 1960 calf crop is now here. The Angus and Lionheart calf crops are good but difficulties have been experienced with the David and Prince lines. There appears to be a genetic-nutrition involvement in the development of hydrocephalus (water on the brain) in cattle in which animals inherit the tendency and a lack of iodine results in the condition. Several years ago we had trouble with hydrocephalus and our studies revealed that these animals had enlarged thyroid glands. Iodized salt was used and no more calves were produced with either enlarged thyroid gland--or hydrocephalus. This past year non-iodized salt was used and 5 out of 7 calves sired by one bull in the Prince line have been born with hydrocephalus and have died. Studies will be made again to determine if iodized salt will prevent the occurrence of this condition.

Bulls have been used from each of the four lines of Herefords on cows at the Union Station. Steers are fed out by line of sire and carcass data are obtained on them. Three bull calves sired by bulls of the four lines are individually fed and heifers sired by these bulls are retained as replacements to determine their calf-producing abilities. The second group of steers will be slaughtered in the near future. Data on one year did not provide sufficient numbers to draw conclusions relative to differences among bulls from the lines in growth, feed efficiency and carcass characteristics of their offspring.

The work with the Squaw Butte Station on testing cattle under different levels of feeding will be completed during the next year and this information will be published and made available to producers. At present it appears that a more reliable test is obtained when animals are fed to give a higher rate of gain than when the ration is primarily composed of low-grade roughages.

A few Beefmaster animals are being used to study their adaptability to Western Oregon conditions both as a breed and as animals to use in crosses. A limited number of Angus X Hereford crosses have been made for comparison

with the Beefmaster by Angus and by Hereford crosses. Results so far indicate that Beefmasters are heavier than the Angus or Hereford calves at weaning. Beefmaster crosses have been quite variable on feed tests and no slaughter or carcass data are available yet.

Beef Cattle Investigations

Union Station

J. A. B. McArthur

Two beef cattle research projects are carried on at the Eastern Oregon Branch Experiment Station. One is a breeding study on improvement of beef cattle cooperative with the Dairy and Animal Husbandry Department of Oregon State College and was initiated in 1957. The other is titled, "Feeding and Management Practices for Cow-calf Beef Cattle Production in Eastern Oregon Other Than the High Desert Area", and was initiated in 1956.

The breeding study involves a comparison of the progeny of four lines of Hereford bulls when mated to uniform groups of Station cows. The bull lines represent the Prince, David and Lionheart lines from the College herd and a Chandler line from the Station herd.

Birth weights, suckling gains, and weaning weights are determined on all calves. Selected bull calves are fed for rate and economy of gain on feed test. Steer calves are fed to slaughter grade to get feed lot performance, slaughter and carcass data.

Only one year's record is complete and numbers are too small for valid comparisons. The work will continue until four years' records have been completed, at which time the breeding worth of the four lines of bulls will be evaluated on the basis of the performance of their progeny.

Data have been collected on the management study since 1956. A 150 cow herd of Herefords is maintained. The management schedule consists of a 60-day breeding season, weaning calves at an average age of 7 to 7½ months, followed by a 5-months' wintering and a 7-months' pasturing season. Heifers are bred to calve as 2-year-olds. The effects of three levels of wintering weaner heifer calves and bred yearling heifers on subsequent summer gains and on their breeding and calving performance are being investigated.

Although numbers are too small to warrant conclusions at this time, there have been no advantages in adding grain to the grass-alfalfa hay fed ad lib to weaner calves or to bred yearling heifers.

The addition of 2 or 4 pounds of grain per head daily to the grass-alfalfa hay wintering ration did not affect the conception or calving rate. Although heifers receiving grain made greater winter gains, those wintered on hay alone made greater summer gains. Weights of two-year-old heifers were not affected by levels of winter feeding either as weaners or as yearlings.

The grass-alfalfa hay fed had a crude protein content of about 10.5 per cent and when fed ad lib., weaners and yearlings have gained at the rate of one pound per day during the wintering period.

Beef Cattle Research

Astor Station

H. B. Howell

Beef cattle research at the J. J. Astor Experiment Station has for the past several years been based upon investigations into the mineral supplement requirements of these animals under the high rainfall conditions of the Oregon Coast. The problems include grass tetany, scouring, lack of phosphorus assimilation, and occasional cobalt deficiency. Some of the 45 head of grade Herefords are currently being used in experiments with supplemental injected copper, with and without cobalt. The cobalt is being given as a "cobalt bullet" as developed in Australia.

Final conclusions cannot be made as yet, but the work indicates very definitely that

(1) Grass tetany can be prevented by feeding a mineral which includes magnesium sulphate;

(2) Grass tetany cases can be cured by intravenous injections of calcium and magnesium, if the animals are found in time;

(3) Nutritional scours in cattle may be largely prevented by including copper sulphate in the mineral mixture or cured by the timely administration of copper sulphate tablets;

(4) The addition of copper to the ration seems to aid in the assimilation of phosphorus by the animal provided sufficient phosphorus is offered;

(5) Cobalt deficiency, particularly in young cattle, can be prevented by very small doses of cobalt and it is good husbandry to use a mineral containing cobalt or to use cobaltized salt. No definite evaluation of the cobalt bullet as compared to other methods of administration is yet possible.

Pelleted and Wafered Feeds for Beef Cattle

Malheur Station

E. N. Hoffman

Many changes are taking place in the business of livestock feeding, including use of new materials and new mixtures of old ones in cattle rations, and different methods of processing feeds. Among the latter, pelleting and wafering of roughages have attracted considerable interest. During the past two years, trials have been carried out at the Malheur Branch Experiment Station, Ontario, Oregon, investigating various aspects of the feed processing situation. Yearling steers from the Squaw Butte Station, weighing 750 to 800 pounds are used in the 140-day feeding trial. The average initial lot weights in the 1959-60 trial varied from 768 to 798 pounds and final weights varied from 1133 to 1203 pounds. The ration treatments were as follows:

Lot	Ration
1	Completely Wafered Ration--47½ per cent alfalfa and 52½ per cent mixed grain
2	Alfalfa Wafer and Loose Grain Mix + Molasses
3	Completely Pelleted Ration--47½ per cent alfalfa and 52½ per cent mixed grain
4	Alfalfa Pellet and Loose Grain Mix
5	Chopped Alfalfa and Loose Grain Mix + Molasses
6	Chopped Alfalfa and Ground Ear Corn

All cattle were Stilbestrol implanted - 30 mg. per head. Steamed Bonemeal was offered free choice to all lots. The grain mixture in lots 1 through 5 consisted of equal parts of ground ear corn, ground barley and dried beet pulp.

Results in terms of average daily weight gains, and feed costs per pound gain are listed in the following table. It should be pointed out that feed costs are f.o.b. source, and do not include hauling or storage.

Lot	Average Daily Gain	Feed Cost/Lb. Gain
1	2.93 lb.	19.6 ç
2	2.66	19.4
3	2.75	22.6
4	2.89	19.0
5	2.50	19.2
6	2.46	18.5

The feed period of 140 days extended from November 10, 1959, to March 28, 1960. While there was little extreme cold (lowest minimim--2° above) most of the period averaged below normal. There was a total of 5.48 inches of precipitation during the 140 days. Much of this was concentrated into a few periods of heavy precipitation.

This was the second year's trial of comparing hay wafers, hay pellets and chopped hay and completely wafered and completely pelleted rations. Two changes were made. The ratio of hay to grain was changed from 60 per cent hay and 40 per cent grain fed the first year (1958-59) to 50 per cent grain and 50 per cent hay this year plus the addition of 5 per cent molasses which resulted in a ratio of 52½ per cent grain and molasses and 47½ per cent hay. The molasses was incorporated into the complete wafer, complete pellet and the straight hay pellet but because of mechanical problems was not incorporated into the straight hay wafer. Molasses was supplied in liquid form to Lots 2 and 5.

No "breaking-in" period was used in putting the complete wafer and complete pellet lots (1 and 3) on full feed. These steers individually consumed as much as fifteen pounds of the grain mix by the second day on feed with no ill effects.

It should be pointed out that under the conditions of this experiment, Lots 1 and 3 consumed 79 and 148 less pounds of grain and molasses respectively than did Lots 2 and 5. Likewise Lots 1 and 3 consumed 119 and 168 less pounds of grain and molasses respectively than did Lot 4 where 10 per cent molasses was included in the hay pellet. This may have had some effect on the final live grades (March 29).

One steer in Lot 1 died during the first two weeks of the feed period and was replaced. The cause of death was not definitely determined. There was one sick steer in Lot 2. There was one bloat case in Lot 3 and two cases in Lot 5.

Apparently pelleting or wafering either the roughage portion, or the complete feed mix, resulted in faster weight gains. There was no difference in performance between pellets and wafers. The higher feed costs per pound gain on the pellets reflects a higher processing cost involved. Live grades were put on all animals at the end of the trial as follows: Lot 1 - 3 choice, 5 good; Lot 2 - 6 choice, 2 good; Lot 3 - 3 choice, 5 good; Lot 4 - 6 choice, 2 good; Lot 5 - 5 choice, 3 good; Lot 6 - 8 good.

There are many factors to consider in an overall evaluation of feed processing methods. These and other experiments may help provide the data necessary to determine where they may economically be applied in practice.

Winter Feeding Studies

Squaw Butte Station

Joe D. Wallace

In the beef cattle research program at Squaw Butte, major emphasis is placed upon the nutrition of range cattle. This includes not only the summer grazing period spent on sagebrush-bunchgrass range and areas seeded to crested wheatgrass, but also the wintering period when cattle are fed primarily on native hay produced in the flood meadows typical of southeastern Oregon. Problems relating to management, breeding, and disease control in beef cattle are also given consideration. These factors along with cooperative studies conducted with ARS range and meadow research men stationed at Squaw Butte help to give a well balanced research program.

I. Relationship Between Summer Gain of Yearling Feeders and Previous Winter Gain Under High Desert Conditions of Eastern Oregon.

A large number of commercial cattlemen in eastern Oregon and adjoining areas concentrate their ranching programs around the production of long yearling feeders. The weight accumulated by such feeder animals following weaning occurs during a relatively long winter feeding period and a comparatively short summer grazing season. Although these conditions prevail, many ranchers tend to "rough" weaner calves through the winter hoping that compensatory summer gain will produce a high total selling weight. Their belief is that winter gains on calves are extremely costly and also that if a calf gains over 0.50 to 0.75 pound per day during the winter, his summer gain on grass is apt to be depressed.

Several factors have raised questions as to whether the prevailing practice is the most economical:

(1) The summer grazing period in this area is quite short, consequently a high rate of daily gain through the summer may not result in a great total gain.

(2) Weaner calves are at a stage in their growth cycle where they can make more efficient use of nutrients than will ever be possible at a later period in their development.

(3) Seven years of experimental evidence from the Squaw Butte herd indicate that over a rather wide range (0.4 to 1.6 pounds per day) winter gains have little effect on summer gains. The decline in rate of gain on summer range was noted when animals gained over 1.6 pounds per day during the winter period.

Table 1 shows the effect of wintering range calves at various levels on subsequent performance and return on feed investment. The cost per pound of winter gain for calves fed meadow hay alone was over twice the amount shown for calves receiving 2 pounds of barley and 1 pound of cottonseed meal as a supplement to the hay. The subsequent summer gain of calves wintered on hay alone was only slightly greater than those fed a supplement with the hay. Calves receiving the hay plus supplement (group 2) showed $22.25 (per head) more return on feed investment than those receiving hay alone.

TABLE 1. EFFECT OF WINTERING RANGE CALVES AT VARIOUS LEVELS ON SUBSEQUENT PERFORMANCE AND RETURN ON FEED INVESTMENT

Data taken from several experiments over a period of years at Squaw Butte		Ration		
		Meadow Hay Alone	Hay + 2 Lbs. Barley + 1 Lb. CSM	50% Hay 34% Barley 16% CSM
Winter Period (180 days)	Daily gain (lb.)	0.3	1.3	1.8
	Total gain (lb.)	54	234	324
	Feed/lb. gain (lb.)	33	10	7.5
	Cost/lb. gain (¢)	33.0	15.0	16.5
	Winter feed cost ($)	$18.00	$36.00	$53.00
Summer Period (120 days)	Daily gain (lb.)	1.60	1.44	1.20
	Total gain (lb.)	192	173	144
Total (Winter + Summer)	Total gain (lb.)	246	407	468
	Gain value @ $25 cwt. - Feed cost ($)	$43.50	$65.75	$64.00

As pointed out in the table, wintering calves on the more liberal ration (group 3) proved less economical than feeding small amounts of supplements. The added winter feed costs on the more liberal ration plus the fact that these animals gained considerably less during the summer account for this difference.

Supplementing a native hay ration for weaner calves with a minimum amount of properly selected concentrates can result in a more rapid and efficient gain during the winter, a weight advantage that is easily retained through the summer, and finally more weight and higher condition at selling time as long yearlings.

Results of Squaw Butte research show that in order to reach a heavier weight on long yearling feeders, ranchers must capitalize on both the winter feeding period and the summer grazing season. More specifically, these data indicate that ranchers should strive to promote an optimum rate of winter gain on weaner calves that will not have a depressing effect upon their gain on grass the following summer.

II. Wintering Range Calves on Pelleted, Wafered, or Chopped Meadow Hay.

Farm equipment manufacturers are working diligently on the development of field pelleting and wafering machines. By the time such machinery becomes practical for rancher use, we hope to have some of the answers regarding the nutritional value of pelleted or wafered native meadow hay.

Through the process of pelleting or wafering hay, problems related to handling, storing, and feeding the hay are greatly reduced. Pelleting a weedy or unpalatable hay renders it more acceptable to beef cattle. The main disadvantages for the processed hays are the added costs of grinding and pelleting or wafering along with the transportation costs to and from the feed mill. Naturally these costs will vary from ranch to ranch.

Changing the form of hay from loose hay to a pellet or wafer doesn't necessarily increase its feeding value when comparisons are made on a pound for pound basis. The increase in performance resulting from feeding hay in a pelleted form is due to increased consumption. Feed efficiency appears greater on pellet-fed animals since proportionately more feed is consumed for gain rather than maintenance. Data from this station has indicated that when a calf is fed chopped or wafered meadow hay alone, the nutrients are used almost entirely to meet the maintenance needs of the animal; therefore, little gain is made.

A summary of a 126-day winter feeding trial in which calves were fed pelleted, wafered, and chopped meadow hay is shown in Table 2. In this trial calves consumed approximately 25% more on a pelleted meadow hay ration than similar calves fed the same hay in a coarsely chopped form. Calves fed wafered hay consumed only slightly more than those fed chopped hay. Consequently, rather marked increases in calf performance were obtained where hay pellets were fed in place of chopped hay and only slight differences in performance were noted between calves fed wafered and chopped hay. The calves receiving chopped hay plus supplement were the only group that made economic gains in this study. Hay refusal percentages indicate that animals receiving chopped hay were more selective in consuming certain portions of the hay. This may partially explain why animals fed chopped hay alone made slightly better gains on less feed than animals in the wafered hay group.

TABLE 2. RESULTS OF WINTERING RANGE CALVES SOLELY ON PELLETED, WAFERED, OR CHOPPED NATIVE MEADOW HAY AND ON CHOPPED HAY PLUS SUPPLEMENT

126-Day Feeding Trial (Dec. 1, 1959 - Apr. 5, 1960)	Ration			
	Pelleted Hay Alone	Wafered Hay Alone	Chopped Hay Alone	Chopped Hay + 2 Lbs. Barley + 1 Lb. CSM
No. of Animals	10	10	10	10
Avg. Initial Wt. (lb.)	360	357	358	358
Avg. Final Wt. (lb.)	449	394	404	522
Avg. Daily Gain (lb.)	0.71	0.30	0.37	1.30
Avg. Daily Feed Cons. (lb.)	12.3	10.1	9.9	12.8
Percent Hay Refusal (%)	2.7	13.5	18.7	18.2
Feed/Lb. Gain (lb.)	17.3	33.7	26.8	9.8
Feed Cost*/Lb. Gain (¢)	29.4	50.7	26.8	15.2

*Feed costs used:

Pelleted meadow hay	$34.00 per ton
Wafered meadow hay	30.00 " "
Chopped meadow hay	20.00 " "
Barley	60.00 " "
Cottonseed meal	80.00 " "

III. Yeast in the Winter Ration for Range Calves.

Yeast preparations can be included in the long list of so-called feed additives that are presently being incorporated in cattle feeds. Various types of yeast materials (wood yeast, brewers' yeast, and bakers' yeast) are being used. Some of these materials have been tested quite extensively while others have received little attention. Naturally, it is difficult to predict the action of one specific yeast compound from experimental results obtained with others.

An experiment involving a highly refined brewers' yeast product (Amber BYF) has recently been completed at the Squaw Butte Station. This product is composed of 50% protein, substantial amounts of many of the B vitamins, as well as unidentified growth factors. The nutritional component of all yeast materials which has attracted most research attention has been the unknown or unidentified factor since the other constituents can be supplied more economically by other feed sources.

In the Squaw Butte study, the yeast product was first subjected to investigation in the"artificial rumen" (measurement of rumen bacterial activity in a laboratory flask or test tube). Here it was found that a small amount of yeast added to the nutrient medium would increase the ability of rumen micro-organisms to digest cellulose.

Following these preliminary investigations, a feeding trial was conducted to determine the effect of including a small amount of the yeast compound in a high roughage, wintering ration for calves. Results of this trial are shown in Table 3. These results compare favorably with those obtained at the Indiana Experiment Station with bakers' yeast and at the Iowa Experiment Station with torula (wood) yeast.

TABLE 3. WINTER PERFORMANCE OF RANGE CALVES FED MEADOW HAY ALONE, MEADOW HAY PLUS BARLEY, AND MEADOW HAY PLUS BARLEY AND YEAST

112-Day Feeding Trial (Dec. 11, 1959 - Apr. 1, 1960)	Ration		
	Meadow Hay Alone	Meadow Hay + 2# Barley	Meadow Hay + 2 Lbs. Barley 0.15 Lb. Yeast*
No. of Animals	3	3	3
Avg. Initial Wt. (lb.)	405	409	411
Avg. Final Wt. (lb.)	445	491	502
Avg. Daily Gain (lb.)	0.36	0.73	0.81
Avg. Daily Feed Cons. (lb.)	10.2	11.5	12.0
Feed/Lb. Gain (lb.)	28.3	15.8	14.8
Feed Cost**/Lb. Gain (¢)	28.3	21.2	24.8

* Yeast product used was "Amber BYF" supplied by Amber Laboratories, Inc., Milwaukee, Wisconsin.

** Feed costs used: Meadow Hay $20.00 per ton
Barley 60.00 " "
Yeast 600.00 " "

IV. Antibiotics in the Winter Ration for Weaner Calves.

The use of antibiotics in fattening rations for beef cattle has been studied quite extensively; however, less work has been conducted concerning the use of these materials in the wintering rations for range calves.

The beneficial responses (increased gains and improved feed efficiency), sometimes derived from antibiotic feeding, are presumed to be due to its "selective-action" on the microflora of the rumen. In general, the degree of response to the inclusion of antibiotics may be expected to vary with feed lot conditions and disease levels. Under unsanitary feed lot conditions or where unthrifty cattle are fed, the response would naturally be greater. Further experimental evidence indicates that increased vitamin A storage in the liver, fewer abscessed livers, and a prevention of shipping fever may result from antibiotic supplementation.

Feeding trials designed to evaluate the effectiveness of including antibiotic in the winter ration for weaner calves have been conducted at the Squaw Butte Station. Results of these studies are presented in the following table:

TABLE 4. EFFECT OF ANTIBIOTIC SUPPLEMENTATION ON THE PERFORMANCE OF WEANER CALVES FED A HIGH ROUGHAGE WINTERING RATION

		Treatment	
		Antibiotic	No Antibiotic
42-Day Study (Fall - 1959)	Avg. Da. Gain (lb.)	1.60	1.28
	Feed/Lb. Gain (lb.)	6.19	6.88
112-Day Study (Winter 1958-59)	Avg. Da. Gain (lb.)	1.48	1.34
	Feed/Lb. Gain (lb.)	8.98	9.80

Calves used in these studies received a full feed of meadow hay, 2 pounds of barley, and 1 pound of cottonseed meal as a basal ration. Calves

receiving antibiotics were fed 75 milligrams per head daily which is the recommended feeding level. At current prices the daily cost of providing the antibiotic was less than 1 cent per head. The antibiotic used was Terramycin since this material was provided to the station as a research grant.

In some cases, a temporary reduction in feed consumption may occur when cattle are first placed on feed containing antibiotic; however, this was not evident in the Squaw Butte studies.

The following methods of supplying antibiotics to calves were studied in the Squaw Butte trials:

(1) Mixing antibiotic in the protein supplement (cottonseed meal).

(2) Providing the material in a loose salt mix.

(3) Mixing a soluble form of antibiotic in the drinking water.

All of the methods were successful. However, under the conditions of these studies, mixing antibiotic in the protein supplement was most effective.

Performance Testing Bulls

W. Dean Frischknecht

Genetic improvement in commercial cattle usually comes as a result of improvement in purebred herds. Cattlemen look to the purebred breeder for this improvement.

One way to make rapid improvement in beef cattle is through the use of outstanding sires. Selection of these sires should be made on the basis of ancestry, performance and conformation, and performance and conformation of their progeny. Even when there are performance records available the higher performing animals will not always produce higher performing offspring. In some characteristics we are able to obtain about 50% to 70% of what we reach for, so progress is possible and records have meaning.

Records of importance are weaning weight and grade, yearling weight and grade, feed lot performance, and potential carcass merit. We should strive to obtain bulls which have been tested and found to be superior in all of these characteristics. Naturally we must cull and eliminate inferior animals and those with inherited defects.

To obtain the best estimate of the growth potential of a young bull he should be allowed to grow at his optimum rate to approximately market weight. It is recommended that a feed test be conducted on the ranch on a group basis or by individual feeding. Individual feeding is more expensive and time consuming but gives a truer picture of the performance of each animal. Market cattle are group fed, and there is some advantage in feeding bulls under the same conditions as market cattle.

Bulls going on a feed test should be weaned and between 7 and 12 months of age when the test is begun. These cattle should be weighed by the rancher and county agent at beginning and close of the test period. They should be weighed with an ordinary fill, neither excessively full nor shrunk out. It is recommended that they have access to feed and water for at least two hours prior to weighing.

Performance Registry International recommends that bulls on a 140 day feed test be on the test ration for 2 weeks before initial weights are taken. Final weight should be taken at approximately the same time of day and in the same manner as initial weight. Better doing bulls on full feed should gain a minimum of 2.6 pounds per day or a total of 364 pounds in 140 days. Such bulls are capable of improving the performance of most commercial cattle.

Continuous growth in young cattle is important. Yearling weight and grade are good indications of this characteristic. This weight should be taken between 12 and 18 months of age and can be corrected to a 12 month basis. Better doing bulls should weigh 900 to 1000 pounds at 12 months depending on the feeding program.

Progeny testing bulls is the final and surest test. This cannot be done where two or more bulls are used together, but it is a necessity in purebred herds. After a bull is selected on his own growth rate and conformation he can go into the breeding herd and be evaluated on the basis of his progeny. Progeny testing should include following the offspring through the feedlot and also through the packing plant to determine carcass merit.

Performance testing procedures have been in use in Oregon for several years. A recent brochure explaining the present program is available in the county Extension offices. Forms and instructions are included.

This program is also improving management through use of simple records of production. Good management is necessary to locate animals with a potential for genetic improvement.

Beef Feeding Experiments 1958-59

Milton-Freewater

David C. England, W. H. Kennick, and Norton O. Taylor

The Milton-Freewater beef feeding experiments have the broad objective of determining most effective means of using locally available feedstuffs in efficient production of desirable quality beef. Weaner steer calves were used in the 1958-59 experiments. Specific objectives were:

1. Investigate the effects of various feed additives on alleviation of stress resulting from transportation, handling and early feedlot adjustment.

2. Compare effect of alfalfa hay, peavine hay, and peavine silage on rate and cost of gains for wintering and fattening.

3. Determine effect of different levels of grain feeding on rate of gain and cost of wintering and fattening.

4. Compare implanted stilbestrol and Synovex as growth stimulants during wintering and fattening.

5. Compare effect of different reimplantation dosages of stilbestrol on rate and economy of gain and on carcass quality.

6. Determine effect of Co-Ral treatment for control of cattle grubs on rate of gain.

7. Determine effects of various rations and hormone treatments on carcass grade and eating quality of the beef.

Weaner steers used averaged 469 pounds initial weight and graded mostly good and choice as feeders. The concentrate ration was pelleted in 3/8 inch cubes and consisted of 1350 pounds barley, 300 pounds beet pulp, 200 pounds wheat mill feed, 100 pounds molasses and 50 pounds salt. Crude protein content averaged 10.5%. Cost averaged $52.78 per ton.

Alfalfa hay, peavine hay, and peavine silage were the roughages used. Crude protein content was approximately 14%, 11.5% and 11%, respectively, on a dry matter basis. Dry matter content averaged approximately 86%, 83% and 29%, respectively. Roughages were full fed.

Cost of roughages per ton were: Alfalfa hay $22, peavine hay $17 and peavine silage $5 per ton.

Yardage was figured at 7¢ per head per day in computing costs and net returns. All animals were sold on a carcass grade and yield basis.

Wintering Results:

1. Effect of Feed Additives on Steers.

During the first 35 days in the feedlot, all calves were fed an average daily ration of 2.4 pounds grain mix, 4.0 pounds chopped alfalfa hay and 21.0 pounds peavine silage. Average daily gains were not improved by addition to the daily ration of each animal either 1.5 mg. Dynafac, 2.5 mg. tranquilizer (hydroxyzine), 50 mg. Terramycin, or a combination of these additives.

2. Roughage Comparison.

TABLE 1. EFFECT OF PEAVINE SILAGE, PEAVINE HAY, AND ALFALFA HAY ON AVERAGE DAILY RATE AND COST OF GAINS OF WEANER STEER CALVES DURING WINTERING (DEC. 8 TO FEB. 9 - 63 DAYS)

Criterion	Peavine Silage	Peavine Hay	Alfalfa Hay
Number of animals	54	36	72
Av. daily grain intake (lbs.)	2.5	2.5	2.6
Av. daily roughage intake (lbs.)	30.3	10.9	11.5
Av. daily gain (lbs.)	1.16	1.63	1.87
Feed cost per lb. gain	$0.125	$0.101	$0.108
Feed and yardage cost per lb. gain	$0.185	$0.144	$0.146
Cost per head per day	$0.215	$0.235	$0.273

Alfalfa hay produced highest average daily gains but peavine silage--due to low cost per ton and lower average daily gain--provided lowest daily cost per head. Peavine hay was superior to peavine silage as a wintering roughage.

3. Levels of Grain.

Effect of different levels of grain feeding on wintering gains is shown in Table 2. Full fed peavine silage was the roughage.

TABLE 2. AVERAGE DAILY GAINS AND COST OF GAINS MADE BY WEANER STEER CALVES FED DIFFERENT LEVELS OF GRAIN WITH FREE CHOICE PEAVINE SILAGE (DEC. 8 TO FEB. 9 - 63 DAYS)

No. of Animals	Ave. Daily Feed Intake Grain Lb.	Ave. Daily Feed Intake Silage Lb.	Average Daily Gain Lb.	Cost/Lb. Gain Feed Only $	Cost/Lb. Gain Feed Plus Yardage $	Cost/ Head Daily $
54	2.5	30.0	1.15	0.125	0.186	0.214
18	5.0	26.1	1.47	0.135	0.183	0.269
36	7.0	24.5	1.77	0.140	0.180	0.319

4. Hormone Treatments.

Synovex and implanted stilbestrol were compared with non-implanted animals on rations producing approximately .9 pound average daily gain and 1.6 pound average daily gain. Synovex improved daily gains by approximately .5 pound and .25 pound, respectively, on the two rations. Comparable improvement from stilbestrol implantation was .3 pound and .2 pound, respectively.

Fattening Period

1. Roughage Comparisons.

The relative values of alfalfa hay, peavine hay and peavine silage were different during fattening than during wintering (Table 3).

TABLE 3. AVERAGE DAILY GAINS OF WEANER STEERS FED DIFFERENT ROUGHAGES DURING FATTENING (FEB. 10 TO AUG. 10 OR 17 - 181 DAYS)

Criterion	Peavine Silage	Peavine Hay	Alfalfa Hay	Alfalfa Plus[2] Peavine Silage
Number of animals per treatment	36	36	36	36
Av. daily grain intake (lbs.)	9.1	9.7	9.6	9.8
Av. daily roughage intake (lbs.)	28.7	10.8	12.6	(3.0 alf. + (23.4 silage
Av. daily gain (lbs.)	2.15	2.30	2.15	2.30
Feed cost per pound gain	$0.146	$0.153	$0.183	$0.154
Feed and yardage cost/ lb. gain	$0.178	$0.184	$0.216	$0.189
Carcass grade[1]	4-28-3	1-32-2	6-23-7	9-24-2
Net return per head	$8.97	$12.65	$5.97	$15.47

[1] Numbers refer to choice, good and standard, respectively.
[2] Alfalfa and peavine silage fed on an equal dry matter basis first 84 days. Thereafter, only peavine silage was fed.

Average daily gains during the last approximately 100 days of feed were 2.70, 2.66 and 2.47 pounds, respectively for peavine silage, peavine hay and alfalfa hay.

It is not clear whether increased grain level or warmer weather is responsible for the marked shift in response to alfalfa hay and peavine silage. A proper combination of these roughages in which each is used during the most favorable stage can increase performance levels and net returns as shown in Table 3.

2. Grain Levels.

Total daily grain feeding per pen has been based on average body weight of the entire pen. Daily grain feeding is expressed as a percentage of average body weight. Different percentages refer to different portions of the entire feedlot period and are successive. Those rations in which grain level increases to higher percentages as body weight increases are referred to as "sliding scale" rations. Data are given below in Table 4.

TABLE 4. EFFECT OF AMOUNT AND SEQUENCE OF DAILY GRAIN INTAKE ON RATE AND COST OF GAINS AND NET RETURNS OF FATTENING WEANER STEERS (DEC. 8 TO SEPT. 17 - 253 DAYS)

Daily Grain Level[1]	No. Animals	Ave. Daily Feed Grain (lbs.)	Ave. Daily Feed Peavine Silage (lbs.)	Ave. Daily Gain (lbs.)	Feed Cost Per Lb. Gain $	Carcass Grade[2]	Net Return Per Head $
½-1-1½-1½	36	7.5	29.0	1.91	0.142	4-28-3	8.97
½-1-1½-2	18	9.1	23.5	2.07	0.146	6-12-0	16.72
1-1½-1½-2	18	11.0	19.6	2.09	0.164	5-13-0	12.47
1½-1½-1½-1½	18	10.2	24.0	2.08	0.158	6-12-0	13.48
1½-1½-1½-2	18	11.8	21.5	2.29	0.191	10-7-1	20.77

[1] As per cent of body weight. Each percentage level refers to a period of approximately 60 days except the last which is approximately 75 days.

[2] Numbers refer to choice, good and standard, respectively.

Increased economy of feed usage and increased net returns resulted from use of the sliding scale when initial grain level was ½ per cent but no improvement resulted from use of the sliding scale when initial level was 1 per cent. The highest level of grain feeding resulted in highest cost of gains, but also returned highest net profits due to greater percentage of choice carcasses.

3. Hormone Implantation Effects.

A single implant of Synovex and Synovex reimplanted on the 84th day of the feeding period were compared with two dosage levels of stilbestrol implanted at the beginning of the feedlot period and reimplanted on the 64th and 148th day in the feedlot. Resultant growth rates, carcass grades and net returns are shown in Table 5.

TABLE 5. AVERAGE DAILY GAINS OF WEANER STEERS IN FEEDLOT IMPLANTED WITH STILBESTROL OR SYNOVEX (36 STEERS PER TREATMENT)

Treatment[1]	Average Daily Gain (Lbs.) 1st Period 64 Days	2nd Period 84 Days	3rd Period 100 Days	Total 284 Days	Total Gain Over Controls (lbs.)	Carcass Grades[3]	Net Return Per Steer $
1. 0-0-0	1.42	1.70	2.40	1.90		8-26-1	10.35
2. Synovex	1.80	1.75	2.82	2.18	67	7-27-2	16.65
3. Synovex-Synovex	1.74	1.85	2.93	2.21	74	9-25-2	19.06
4. 18-18-18 DES	1.67	1.91	2.78	2.19	70	6-29-1	17.01
5. 15-30-15 DES	1.57	1.85	2.76	2.14	56	4-25-6	11.31
6. Co-Ral[2]	1.41	1.77	2.44	1.94	7	13-19-3	12.59

[1] Numbers refer to mg. of stilbestrol implanted at the beginning of each period. Initial implantation of both stilbestrol and Synovex was on the 1st day; reimplants of stilbestrol were made on the 64th and 148th day. Synovex (treatment 3) was reimplanted on the 84th day.

[2] Co-Ral is the trade name of a chemical compound that is under investigation for use in controlling cattle grubs. It is not a hormone, but is included in Table 5 to indicate whether its use affects growth rate.

[3] Numbers refer to choice, good and standard, respectively.

All implant programs increased growth rates and net returns. Carcass grades were not affected by Synovex treatment or by the most advantageous stilbestrol treatment. Similar growth rate was produced by Synovex and Stilbestrol and both produced approximately .3 pound per day faster gain than no implantation. Co-Ral did not improve average daily gains.

4. Carcass Evaluation.

Cooking and taste test panel evaluations were made of 9-10-11th rib roast.

Statistically significant differences ($P < .05$) due to hormone treatments were found only in aroma. Both stilbestrol and Synovex resulted in more desirable aroma scores. The only statistically significant differences ($P < .05$) due to rations was in aroma. Silage-fed animals had more desirable aroma scores than hay-fed animals. The trend of the data, apart from statistically significant differences, show slightly decreased ratings for stilbestrol treated animals, slightly increased ratings for Synovex treated animals, and higher ratings for silage-fed animals than for hay-fed animals. All differences are of such small magnitude as to be of questionable effect on eating quality.

Cooperative Beef Feeding Trials 1959-60

Milton-Freewater

Norton O. Taylor

Feeding trials at Milton-Freewater are cooperative with cattlemen and arrangements differ from Station experiments.

From 5 to 8 different cattlemen furnish cattle each year. Animals are obtained in multiples of 12--either 12, 24 or 36 head--so that each owner has an equal number of animals in each of the 12 pens available for experiments. The owner pays the feed cost, plus a fee in lieu of yardage which is used in the best interests of the trial as determined by the local advisory committee. Cattlemen retain ownership until the cattle are sold for slaughter on completion of the experiments.

A three-man selling committee of cooperators arrange with Experiment Station personnel for sale of cattle so necessary slaughter and carcass data can be obtained. The feed yard is furnished without charge by the Umatilla Canning Company. At various times, equipment such as trucks, tractors with loaders, feed bins and cattle chute, has been supplied by Key Brothers and other cooperators. Wages of the feeders and incidental operating expenses are paid from the Experiment Station budget for this project.

The County Agent supervises the routine feeding operation and serves as liaison between Experiment Station personnel and the cooperators. This is the fifth year of these cooperative trials. Cattle feeders of the area actively participate in planning each year's work and spotlight needed research. The current trial includes studies on:

1. Effects of stress on moving weaner steer calves from ranch to feedlot and in getting them acclimated to feedlot conditions.

2. Performance of small (275 to 350 pound) cattle in feedlot.

3. Effect of pelleting grain and roughage.

4. Comparison of wheat fed at two levels with barley in the concentrate ration.

Each ration is fed to two pens of calves. This speeds results and eliminates need to repeat the work a second year. Ration components and costs are as follows:

# 1 Concentrate - 1625 lbs. barley, 300 lbs. beet pulp, 25 lbs. salt, and 50 lbs. molasses	$50/Ton
# 1 Concentrate plus Terramycin	$56/Ton
Alfalfa Hay	$30/Ton
Alfalfa Pellets	$46.21/Ton
Peavine Silage	$ 5/Ton

Small Weaner Calves.

Sixty head of 304 pound average weight steer calves were selected from the Lightning Creek Ranch, owned by Mike Brennan, of Joseph, in Wallowa County, given various treatments and trucked 150 miles to the feedlots. An antibiotic and three dosage levels of tranquilizer were given to groups of 12 calves, with one group of 12 left untreated to serve as controls. Average daily gains were 1.45 pounds for the controls; 1.49 pounds for the antibiotic and 1.48, 1.49 and 1.51 pounds for the tranquilizer treatments.

Results with these calves suggest that low level tranquilization (1 mg./cwt body weight) may reduce initial shrink but there were no significant differences in rate of gain during the ensuing 100 days on feed.

Preliminary Feeding Period. (100 days, Oct. 8, 1959 to January 18, 1960)

Two animals from each pre-trial treatment group were placed in each pen along with other calves to make 18 calves in each of 6 pens. During the preliminary feeding period, October 8 to January 18 (100 days), there were six pens of calves treated as follows: two pens (36 calves) on alfalfa pellets free choice, plus approximately 5 pounds of peavine silage and ½ per cent of their body weight in concentrate; two pens (36 calves) on alfalfa hay free choice, plus approximately 5 pounds peavine silage and ½ per cent of their body weight in concentrate; and two pens (36 calves) on peavine silage free choice, plus 1½ per cent of their body weight in concentrate.

Results of the first 100 days are given in Table I.

TABLE 1. SMALL CALVES PRELIMINARY TRIAL
(OCT. 8 TO JAN. 18 - 100 DAYS)

		# 1 Concentrate		Roughage			Ave.	Feed
Group	No. of Calves	Per Cent of Body Wt.	Lbs. Fed Daily	Alfalfa Pellets Lbs.	Alfalfa Hay Lbs.	Peavine Silage Lbs.	Daily Gain Lb.	Cost Per Lb. Gain $
1	36	½	1.89	10.65	.19	4.4	1.77	.175
2	36	1½	5.10			16.0	1.32	.129
3	36	½	1.73		7.49	4.3	1.21	.140

Calves receiving alfalfa pellets free choice (group 1) made the greatest gain (1.77 pounds/day) but their gains were also most expensive. Calves fed peavine silage and a higher level of grain (group 2) than the pens receiving alfalfa had a favorable rate of gain and the lowest feed cost. One pen in each treatment group received Terramycin in their feed. The data show no increase in growth rate from the inclusion of Terramycin in the ration at the daily level of approximately 10 mg./cwt of body weight.

Wheat Compared with Barley.

On January 18, the calves were re-lotted in the six pens so that each owner had an equal number of cattle in each pen with an equal number of cattle from each preliminary trial in each pen. Wheat was incorporated into the rations to make up 20% of the concentrate mixture for one group and 40% in a second group. These rations are being compared to the standard barley concentrate mixture. This trial is in progress now and results will be reported later.

Regular Size Weaners.

Regular size weaners averaging 457 pounds were started on preliminary trial October 26, 1959. A pre-trial treatment with tranquilizer similar to that set up with small calves was conducted with 48 head of steers from Cunha Brothers, Stankey range. In these experiments, injections of either tranquilizer, an antibiotic, or a combination of these failed to increase feelot gains.

The preliminary trial period for the regular size calves was from October 26 to December 14, 1959. During this 49-day period all pens received the same roughage and concentrate rations, but Terramycin was added in the feed of two lots and in the water of two lots with two lots remaining as controls. There was no advantage from adding Terramycin to the rations either in the feed or in the water during this time.

Following the preliminary period of 49 days, the regular size calves were placed on feed December 14, 1959. Two pens of 18 calves each are being fed rations as shown below:

Pen Nos.	Concentrate (levels as below)	Roughage
1 & 9	# 1 Pelleted: 1625 lb.barley 300 lb.beet pulp 25 lb.salt 50 lb.molasses	Alfalfa Pellets free choice plus Peavine Silage 2% of body weight
2 & 8	# 1 Rolled: (as above)	Alfalfa Pellets free choice plus Peavine Silage 2% of body weight
7 & 12	# 1 Pelleted: (as above)	Alfalfa Hay free choice plus Peavine Silage 2% of body weight

The level of concentrate feeding will be increased gradually from ½% of the animal's body weight during the first 56-day period to 2% of the animal's body weight during the fourth 56-day period just before marketing.

Hormone treatments were superimposed on both the small and regular size calves, in the same pattern for all pens. A complete report on the 1959-60 cooperative beef feeding will be made on completion of the trials.

Beef Herd Production Goals

John H. Landers, Jr.

Some of the main goals to strive for in beef production are:

a. Wean a 95% calf crop.
b. Average weaning weight of 450 pounds.
c. Wean a minimum of 425 pounds per cow bred.
d. Produce steers that will gain 3.0 pounds per day and grade U.S.D.A. choice weighing 900 to 1,050 pounds.
e. Produce a carcass possessing a rib eye of at least 2 square inches per hundred weight of carcass.

One of the main things which will increase the income of beef cattle producers is to increase calving percentage to at least a 95% calf crop. Calving percentage is the number of calves weaned per hundred cows bred.

Some methods of attaining this goal are:

a. Increase to five the number of bulls per hundred cows.
b. Fertility test bulls.
c. Pasture breed in one or two bull units.
d. Limit the breeding season from a 60 to 90-day period.
e. Have cows gaining in condition at breeding time.
f. Careful observation of cows during the calving season.
g. Control baby calf diseases.

Weaning Weight

The average weaning weight could be raised 75-150 pounds with some changes in management. The average for the state now is about 375 pounds. Some suggested changes are:

a. Cull low-producing cows.
b. Cull late calvers.
c. Higher plane of nutrition of cows after calving.
d. Calving in January and February.
e. Keep replacement heifers from high-producing cows as determined by records.

Performance of Feeder Cattle

Feedlot cattle must gain rapidly and efficiently to meet the competition from other types of animals. Every producer should strive to produce steers that will gain at least 3.0 pounds per day under good feedlot management. This may be attained by using bulls of known gaining ability and cows of known gaining ability.

These steers must reach a U.S.D.A. grade of choice by the time they weigh from 900 to 1050 pounds. This is the present-day consumer demand. Smaller cuts of "Choice" cattle are necessary. Giving close attention to bulls will help attain this objective.

The carcass yield must be pushed up to 60 per cent. More muscle and less fat is the answer to many of the requests of consumers.

Rib Eye Area

Work toward a rib eye area at the tenth rib of two square inches per hundred pounds of carcass weight. To make improvement in this area requires following cattle to the packing plant, getting the carcass measurements, and tying this information back to the matings in the cow herd.

Production Per Cow Bred

Returns from the calf crop are a result of several management factors. An average weaning weight of 425 pounds of calf per cow bred will mean a sizeable increase in the financial return to the beef operator. These calves should grade "good or choice" by feeder standards. The use of production-tested bulls grading 2 or better would improve the calf grades and gaining ability. Year-round nutrition cannot be overlooked.

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