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South Dakota Farm and Home Research

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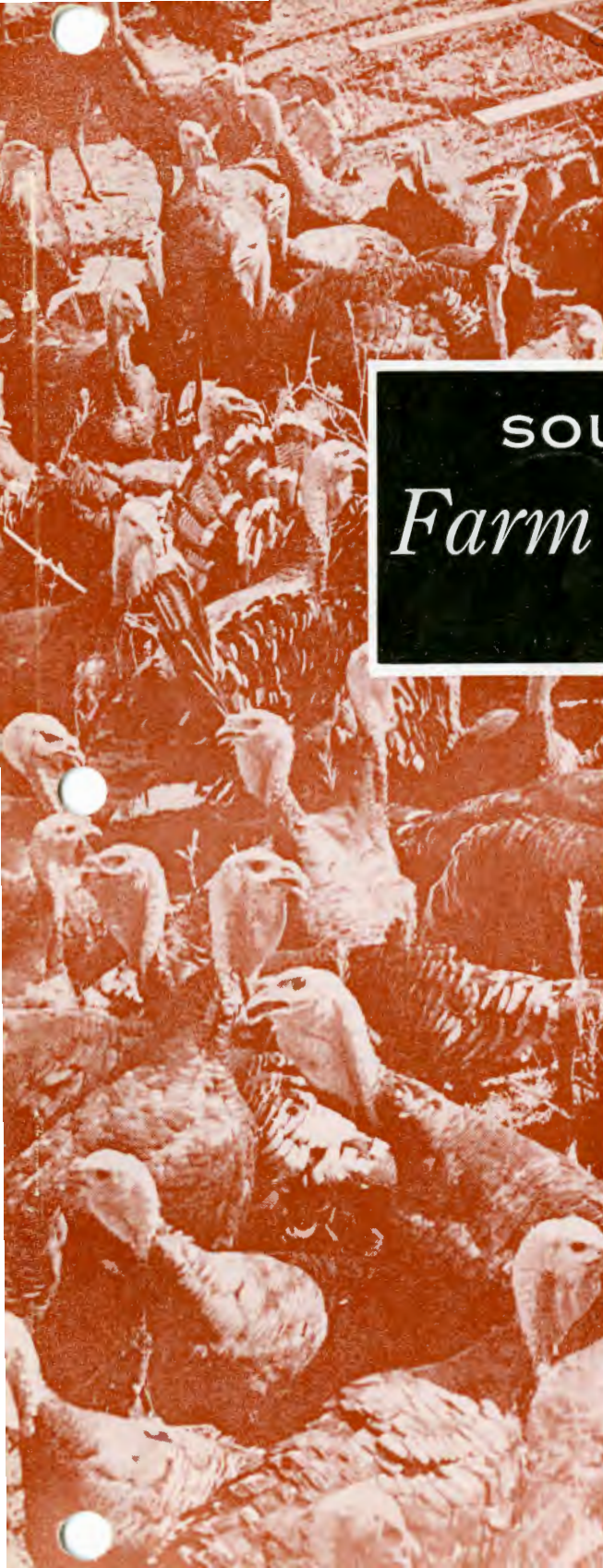


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J.W. McCarty

August 1960
Volume XI, Number 4

SOUTH DAKOTA
Farm and Home
RESEARCH

Energy Levels and Reserpine for
Growing Turkeys—see page 6

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August

SOUTH DAKOTA

Farm and Home

RESEARCH

a report of progress

Volume XI August 1960 Number 4



Allie



Grotta

IN THIS ISSUE

Hail in South Dakota..... 3

By E. M. Frisby, Professor of Weather Engineering. South Dakota's topography and the alignment of its physical features provide all the prerequisites for severe hail formation.

Energy Levels and Reserpine for Growing Turkeys..... 6

By C. W. Carlson, Poultryman. Fat additions cannot be recommended on the basis of this work.

Research Benefits South Dakota... 10

Highlights from the Agronomy Field Day talk by Dean Orville G. Bentley.

Urinary Calculi..... 12

By R. J. Emerick, Associate Biochemist, and L. B. Embry, Animal Husbandman. Following certain rules will help minimize losses caused by this nutritional disease.

The Future of Beef..... 15

By C. A. Dinkel, Associate Animal Husbandman. Breeders should not lose sight of the need for continued improvement in a highly competitive market.

Attitudes of People Toward Experiment Station and Extension Service..... 17

By John D. Photiadis, Assistant Rural Sociologist. Most people interviewed expressed favorable opinions toward the Experiment Station and Extension Service.

Last Issue for Editor and Artist

Two members of the *South Dakota Farm and Home Research* staff are leaving State College for other jobs. John Allie, layout artist for the magazine 6 years, and Gerald Grotta, assistant editor for 3 years, will both leave before the next issue is published.

Allie joined the State College faculty in May 1954. He will become staff artist for the Agricultural College at the University of Connecticut October 1. Dennis J. Holm will replace Allie.

Grotta, who received his Master of Science degree this summer, has returned to newspaper work. He is staff writer for the Watertown *Public Opinion*. Prior to joining the State College faculty in June 1957, he assisted the staff of *Farm and Home Research* in 1955-56 while an undergraduate.

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SOUTH DAKOTA STATE COLLEGE
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SOUTH DAKOTA FARM AND HOME RESEARCH will be sent free to any resident of South Dakota in response to a written request to the Experiment Station Editor, South Dakota State College, College Station, Brookings, S. Dak.



hail in south dakota

By E. M. Frisby

SOME KNOWLEDGE OF HAIL incidence is of interest to South Dakota farmers who seek to shield themselves from financial disaster by means of crop insurance.

Such information is also of vital importance to the meteorologist seeking answers to queries concerning nature's method of operation, prior to attempting to soften some of her more damaging moods. Nature submits to change only when she is completely understood.

The ideal way to study hail type, size, amount, and frequency of occurrence would be to set up a very dense network of observing stations throughout the state. This would be prohibitively costly and impractical at this time. The alternative is to study the record of insurance claims and see whether anything can be learned from them.

Insurance claim data have many limitations when they are used for meteorological purposes. For example, they do not by any means account for all the hail that occurs across the state, since hail insurance is written only on crop land. Thus,

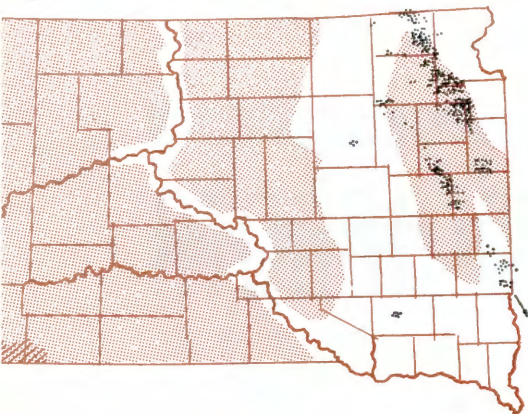
hail claim density is much greater over the eastern than the western half of the state, where forest and range land predominate. Moreover, claims are made only when crops are susceptible to hail damage, and not at all the times when hail falls.

Again, many storms producing ground damage continue over the South Dakota border into Iowa or Nebraska. Since our data are complete for South Dakota only, few ground-damage patterns are known in their entirety.

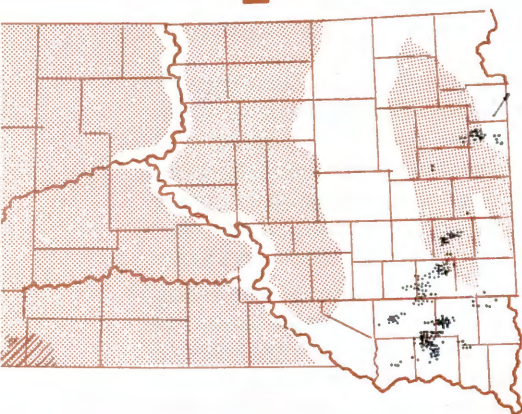
Nevertheless, in the absence of a direct source of information, once the limitations of the indirect data are recognized and allowed for, interesting inferences can be drawn from their use.

Hail claims were plotted geographically by county, township, and section for the six years over which data have been collected (1954 - 59). Damage associated with individual days and storms was found to fall into two main patterns. There were the straight-line, or "swath" damage patterns, and scattered or "all over" patterns. In some

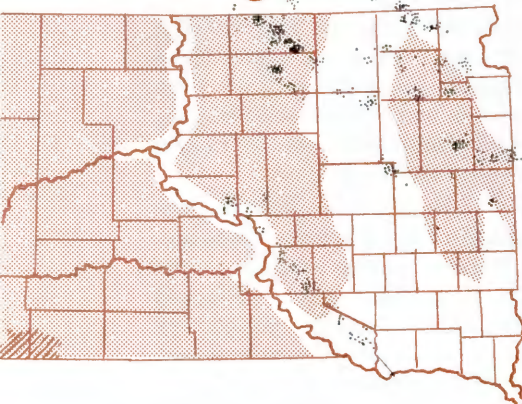
1



2



3



200-500 m



500-1000 m

cases storms moved from northwest to southeast and in others from southwest to northeast. Figures 1, 2, and 3, exemplify these points.

When all the well-marked straight line damage patterns were concentrated on one map, it was easily demonstrated that by far the majority of storms accounting for these losses moved from northwest to southeast, and that there were several breeding grounds for such storms within the state. This statement is still true if the area west of the river is disregarded and attention focussed on the consistently corn growing area of the east (see figure 4).

Isolines of frequency of occurrence of hail damage occurring in storms other than those producing swath type damage are shown in figure 5.

Thus, figures 4 and 5 together summarize the story of hail occurrence in South Dakota in the last six growing seasons, as revealed by the insurance record for those years.

Hailstones fall from thick cloud masses which build up to great heights in the atmosphere and con-

1 Parallel swaths moving northwest to southeast, July 18, 1959.

2 Parallel swaths moving southwest to northeast, August 23, 1959.

3 Combination swath and "all over" pattern, June 17, 1958.

4 Composit "straight line" hail storm diagram, 1954-59.

5 Isolines of township hail incidence, drawn from composit of indeterminate and "all over" patterns, 1954-59.



4 1000-2000 m



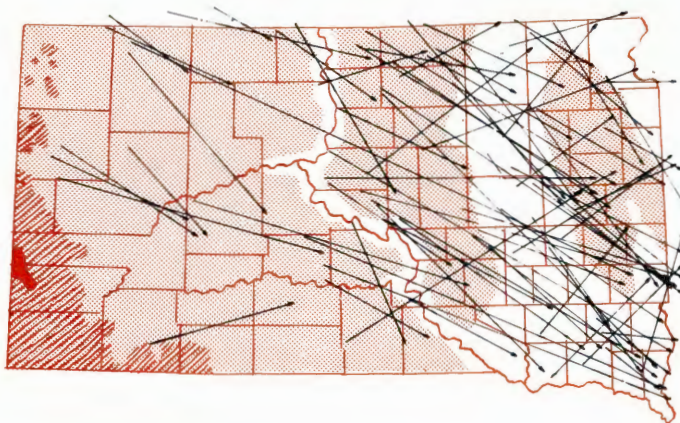
2000-3000 m

tain strong up-currents and high concentrations of liquid moisture.

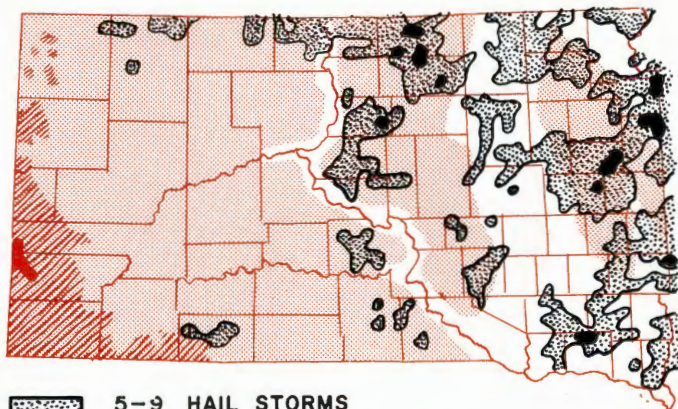
In the summer time, South Dakota is characterized by the presence of an unstable, warm moist airmass from the southeast, which is channelled along its river valleys uninter-

ruptedly to northern most sections of the State. Bluffs and steep banks along river valleys and Coteaux aid in the formation of updrafts, and intrusions of cool air from Canada lend additional instability to an already unstable situation.

4



5



5-9 HAIL STORMS
1954 - 1959
(EXCLUDING SWATH PATTERNS)



10 OR MORE
1954 - 1959
(EXCLUDING SWATH PATTERNS)



energy levels and reserpine for growing turkeys

By C. W. Carlson

PREVIOUS WORK here has shown that the growing turkey, over 12 weeks of age, can tolerate a relatively low energy diet without greatly slowing up its rate of growth. Growth on such diets, made up largely of oats as the major energy source, has been only slightly poorer than growth on relatively high energy diets made up largely of corn. And the growth rates have been better than most of the turkey weights in the various state turkey meat production tests.

Feed efficiency was superior for the high energy diets, as much as 20% better in some studies. Cost of production has also been less with the high energy diets.

More recently, studies have been conducted in which the same high energy diets (largely corn) were compared with a medium low energy diet in which 5% stabilized yellow grease replaced a portion of the oats, thus increasing the energy level. This work indicates that the addition of fat markedly improved the relative performance on the low energy diets. (A summary of this work is available. Write to this station, asking for the article "Oat-Fat Feed

May Be Answer if Corn Prices Climb"; summaries of the previous work are also available.)

The diets were about equal in performance as measured by growth and, for one of the two experiments, feed efficiency as well. The costs of production per pound of turkey were slightly less for the corn diets. A relative change in prices could easily alter the costs to make the oats and fat diets the most economical.

This work suggested that perhaps the addition of fat to the high energy corn diets might well be considered. An experiment involving the addition of 5 to 7% stabilized yellow grease to a high energy diet has just been completed. This variable was tested along with the addition of reserpine to each of the diets.

Reserpine has been shown by Dr. R. E. Ringer of Michigan to dramatically reduce the blood pressure of Broad Breasted Bronze (B.B.B.) turkeys. Dr. Ringer had demonstrated that the blood pressure of B.B.B. turkeys starts to rise when the turkeys reach 8 to 10 weeks of age. Death losses from aortic rupture occur most often after 10 weeks of age. The rupture is usually preceded by an enlargement and weakening of the walls of the large aorta. In three field trials conducted here, involving some 13,000 turkeys, diets containing reserpine stopped the death losses that had been occurring as a result of aortic rupture.

It had not been possible to obtain growth and feed efficiency data in the field trials and so a controlled study was set up. Adding fat to diets has been reported to increase the in-

cidence of atherosclerosis, with the subsequent aortic rupture and circulatory failure, so it seemed logical to consider reserpine as a further dietary treatment, especially for the diets containing added fat.

The regular series of corn diets involved the use of an 18% protein and 1,280 calorie (calories of metabolizable energy per pound) diet from 12 to 18 weeks of age; a 16% protein and 1,320 calorie diet from 18 to 23 weeks of age; and a 12% protein and 1,540 calorie diet from 23 to 26 weeks of age. The series of corn and fat diets was made up to largely correspond as to calorie protein ratios. They contained essentially 20% protein and 1,340 calories (5% fat); 18% protein and 1,380 calories (6% fat); and 14% protein and 1,510 calories (7% fat) for the various age periods, respectively. With the available pelleting facilities, it was impossible to add more than 7% fat to the diets and still have a firm pellet.

Since it was not possible to add more fat, the corn series diets actually exceeded the corn and fat series diets in energy content for the last 3 weeks of the experiment. All diets were fed in the pelleted form as a complete feed. Control diets were fed in comparison to diets in which reserpine was added to each of the series of diets at a level of 0.5 milligrams per pound of total diet.

Data for the 26-week body weights, body measurements, feed efficiency, and dressing percentages are summarized in the table. It is quite evident that there was no consistent growth response to the diets containing stabilized yellow grease.

In the absence of reserpine, only the strain B toms and the strain A and B-1 hens showed a response, whereas in the presence of reserpine, all groups showed a negative response or no response at all.

Further work is necessary to establish whether fat additions to corn diets are really of value, since in the absence of reserpine, the overall averages do look promising. However, since the protein level was increased along with the fat

addition, protein levels may also be involved. Previous work here, as well as the data in the table, would indicate that the level of protein of the corn series diets were adequate for excellent growth, but perhaps not maximum growth.

The diets containing the fat apparently produced less fleshing, as is probably indicated by the breast width measurements. However, in the absence of reserpine the diet containing fat showed approximate-

Effects of Dietary Energy Level and Reserpine on Growing Turkeys

	Chief Energy Source and Treatments			
	Corn*	Corn and 5-7% fat†	Corn and reserpine 0.5 mg./lb.	Corn fat and reserpine 0.5 mg./lb.
Weight at 26 weeks, lbs.				
TOMS:				
Strain A (10-18)‡	26.6	26.6	25.9	25.6
Strain B (15-24)	28.3	29.3	27.5	26.9
Strain B-1 (9-16)§	29.8	29.5	28.2	27.4
Average	28.2	28.5	27.2	26.6
HENS:				
Strain A (11-13)	17.2	18.2	16.8	16.8
Strain B (17-27)	17.5	17.2	17.0	15.9
Strain B-1 (9-14)	18.0	18.7	17.6	16.8
Average	17.6	18.0	17.1	16.5
Breast Width (24 weeks—live, hanging measurement) Inches				
Toms	3.93	3.58	3.50	3.42
Hens	3.65	3.65	3.46	3.34
Lbs. feed/lb. gain 12-26 weeks	5.4	4.6	5.6	5.6
Dressing Percentage, % [3 turkeys of each sex per group and strain (strains A and B only)]				
Toms	82.4	80.4	80.2	80.8
Hens	78.5	79.2	79.2	78.8
Breast Skin Thickness, Inches				
Toms	.48	.48	.50	.55
Hens	.45	.46	.40	.44

*18, 16 and 12% protein with 1,280, 1,320, and 1,540 calories of metabolizable energy per pound of diet at 12, 18 and 23 weeks of age respectively.

†20, 18, and 14% protein with 1,340, 1,380, and 1,510 calories of metabolizable energy per pound of diet and 5, 6, and 7% stabilized yellow grease.

‡Numbers in parenthesis refer to numbers of turkeys per group completing the experiment.

§A late import of Strain B.

ly 15% better feed efficiency. In the presence of reserpine, where growth was retarded by both the reserpine and the corn and fat type of diets, total feed efficiency was not affected by the type of diet.

It is quite evident that reserpine at this level should not be used for the entire 12-26 week period as it was in this instance. In cases where reserpine may be used to stop aortic rupture losses, its use at the 0.5 milligrams per pound level probably should be discontinued after 4 to 5 weeks. Of course, if aortic rupture reappears, reserpine should again be used, and one may have to sacrifice on growth rate in keeping down his mortality rate. In this work reserpine did not evidence a slowing up of the rate of growth until after it had been used 4 weeks. No death losses from aortic rupture occurred in this experiment—fortunately or unfortunately, however one looks at it.

Reserpine appeared to improve finish of the toms but reduced it for the hens, as evidenced by the breast skin thickness. Dressing percentage was not greatly affected by diet,

though the data for toms on the corn diet without reserpine seems to stand out ahead of all of the other groups.

Summary

Fat additions in diets for growing turkeys can not be recommended on the basis of this work. There is some indication that growth, as well as the corresponding feed efficiency, may be improved. However, more work is needed to confirm these observations, particularly on growth.

Since protein level was increased along with the fat additions, the effect of protein may be involved, even though previous work indicates that the protein levels were quite adequate in the control corn diet series.

For maximum growth, it appears that reserpine at the level of 0.5 milligrams per pound should not be used continuously from 12 to 26 weeks of age. When it is used to prevent losses from aortic rupture, reserpine at this level will not greatly interfere with growth, for a 4-week period at least. (Project 242. Poultry Dept.)

FARM AND HOME RESEARCH PAGE SIZE TO INCREASE

The next issue of **South Dakota Farm and Home Research** you receive will have larger pages than this copy. After 11 years as a 6 inch by 9 inch magazine, **Farm and Home Research** will become 8½ inches by 11 inches with Volume XII, Number 1 which will come out in November.

THE FOLLOWING ARTICLE
CONTAINS HIGHLIGHTS FROM
THE TALK GIVEN BY
DEAN ORVILLE G. BENTLEY
DURING AGRONOMY FIELD DAY
AT BROOKINGS JUNE 30

research benefits South Dakota

In the past 18 years, farmers have improved their efficiency more than in the preceding 120 years.

One of the "tools" which has helped the farmer make this rapid progress is agricultural research. In connection with South Dakota State College's 75th anniversary, we have "inventoried" the role of agricultural research in our state. During the coming year, about \$1.50 per person of tax funds in South Dakota will be spent on agricultural research. Here are some of the benefits you will get in return.

\$12,000,000 a Year

Experts estimate that research in corn breeding has increased yields 25 to 30%, or about 8 bushels per acre in our state. Based on 4 million acres of corn, this gives our farmers an extra 32 million bushels of corn each year. Even if we figure that only one-fourth of this results from new, adapted hybrids developed for South Dakota, that's an extra \$8 million for South Dakota farmers each year—much more than the state appropriations for agricultural research in the entire 72 years of the Experiment Station. It means an extra \$120 each year for each farm family.

In addition, there is an annual \$4 million seed corn business in the state that has developed as a result of hybrid corn.

That makes a return of about \$12 million each year from corn breeding research alone—a return of more

than \$15 for each dollar spent on research.

Cattle Production

Total live weight produced on Dakota farms and ranches is more than 100 years ago. Again, if we figure that this increase resulted from methods developed through research, this is an extra \$60 million each year.

That's an extra \$90 million each year invested on agricultural research.

Egg Production

Eggs per hen have doubled in the past 20 years. This means an extra 100 million eggs each year. If research is credited with this increase because of better strains of fowls, better housing and feeding methods, this is an extra 12 million eggs each year, or \$2,400,000 each year for South Dakota.

These are just three examples of the work in progress in agricultural research. More time and money are being spent on agriculture and home life.

And it is impossible to put a price on the returns from agricultural research.

When disease or insect pests are developed, we never know for sure what the returns would have been without research. Our research shows ways to save water. It is difficult to put a price on the resources that are saved through the use of new methods. It is also difficult to value basic research. Application of research is away. Yet basic research is the foundation of advancement. It is the foundation of the farmer and rancher's wealth. Many of the most important advances in the farmer and rancher's life have come without basic research year after year.

Research Tailored to the Farmer

Agricultural research has helped the farmer and ranchers keep abreast of the latest developments in the world.

ent on all agricultural re-

ion up 250%

uction of cattle on South
is up about 250% over 25
re that only one-fourth of
better breeding and feeding
a research, we got an extra
turned for each dollar in-
ch.

on Doubled

bled during the same 25
525 million eggs each year.
one-fourth of this increase,
chickens, new feeding sys-
and management practices,
dozen eggs, or an extra
uth Dakota poultry raisers.
mples. In addition, there is
an 150 other phases of ag-
out a dollar value on many
tural research.

control measures are de-
sure how severe the infes-
without the controls. Much
s to conserve our soil and
money value on our natural
rough research-developed
to measure the benefits of
often may be many years
s essential for continuous
lation for future advances.
at discoveries now helping
ould have been impossible
ago.

o South Dakota

elps South Dakota farmers
of rapid developments in

agriculture. The research is tailored to South Dakota
conditions and results can be applied directly to our
farms and ranches. Without this local research (at sub-
stations and other plots throughout the state as well as
at Brookings) we would rapidly fall behind the rest of
the country.

Results of this research are taken to South Dakota
farmers, ranchers, and homemakers by the Coopera-
tive Extension Service. Many of the research scientists
also teach college courses and work directly with stu-
dents who become some of the leaders in our state's
agricultural development.

Everyone Benefits

So far, we've just looked at how farmers and ranch-
ers benefit from agricultural research. Yet, every
person in the state gains from this work.

At least partly as a result of vastly improved effi-
ciency on our farms and ranches, an hour's pay will
buy you 45% more food than in 1947.

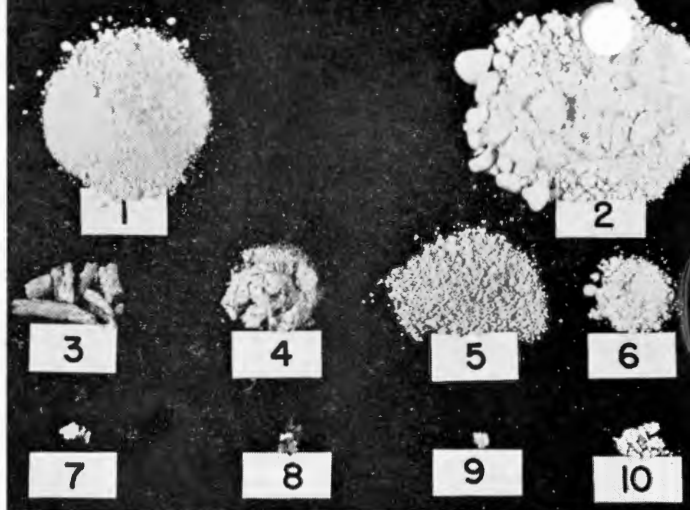
Nationwide, more than one-third of the total
working force is directly dependent on farming and
ranching. While about 7½ million people are working
on farms, another 6 million are in farm supply busi-
nesses and 9 million are employed in processing and
distributing agricultural products. In our state, one of
the most agricultural in the country, the percentage of
people who depend directly on agriculture is even
higher.

And finally, experts estimate that to maintain our
present high standard diet, farmers by 1975 will be
depended upon to produce:

- 36% more eggs
- 48% more dairy products
- 61% more broilers
- 56% more meat animals
- 26% more grain and potatoes
- 60% more fruit and vegetables

So agricultural research is not only a good invest-
ment in terms of dollar returns—it is an essential in-
vestment.

Urinary deposits showing variations in size and shape. (1) Steer bladder deposit; (2) Wether bladder deposit; (3) Steer urethra deposit; (4) Steer sheath deposit; (5) Sheep bladder and urethra deposit; (6) Sheep bladder deposit; (7) Steer urethra deposit; (8) Sheep kidney deposit; (9) Steer urethra deposit; (10) Sheep bladder deposit.



urinary calculi

A NUTRITIONAL DISEASE OF LIVESTOCK

By R. J. Emerick and
L. B. Embry

AMONG NUTRITIONAL DISEASES of the United States, urinary calculi is exceeded only by bloat and poisonous plants as a cause of death. In Canada it has been described as the most important of the nutritional diseases.

The term, urinary calculi, is used to describe deposits of solid material (principally mineral matter) within the urinary tract. The calculi, which may occur as single stones

or as gravel-like concretions approaching the consistency of sand, are often named according to their location within the urinary tract; hence names such as kidney stones and bladder stones.

Symptoms do not generally occur until the stones grow large enough to lodge in the urinary tract and block the flow of urine. If blockage is complete and the stone is not eliminated or removed, the volume of urine accumulating in the bladder increases until rupture of the bladder or urethra occurs. The condition which follows—accumulating of subcutaneous fluid in the abdominal area—is often referred to as “water-belly.”

Sheep and cattle, among the common farm animals, are most often afflicted with urinary calculi. Males are by far the most often troubled. A high incidence of urinary calculi also occurs in mink. The calculi problem in mink, however, warrants special consideration which is beyond the scope of this article.

The exact causes and methods of preventing urinary calculi in rum-

inants are not known. It appears that no one feed, feed mixture, or environmental condition can be predicted to consistently cause or prevent the disease. Specific feeds have been thought to cause urinary calculi in certain instances, but such observations are complicated by the fact that the same feeds are fed for extended periods under apparently similar conditions without producing any known causes of urinary calculi. Hard water has often received the blame, but experimental evidence indicates that this is unwarranted. No correlation has been demonstrated between the hardness of water and the incidence of urinary calculi.

Calculi composed of various materials have been observed. Two distinct types occur in South Dakota. One type is composed chiefly of calcium and magnesium phosphates, while the other type has silica as its principal constituent. Silica is a material that is very abundant in nature, and one form you can readily recognize is common sand. Silica is also found in varying amounts in plants and to a smaller extent in most animal tissues. Silica content of some of the common feedstuffs, as determined on a limited number of samples in our laboratory, is as follows: prairie hay, 4.51%; alfalfa hay, 0.26%; whole oats, 1.04-3.98%; oat kernels, 0.07%; oat hulls, 5.03%; oat straw, 5.00%; shelled corn, 0.01%. Whole oats values represent the range for 20 samples, while the others represent single values in most instances.

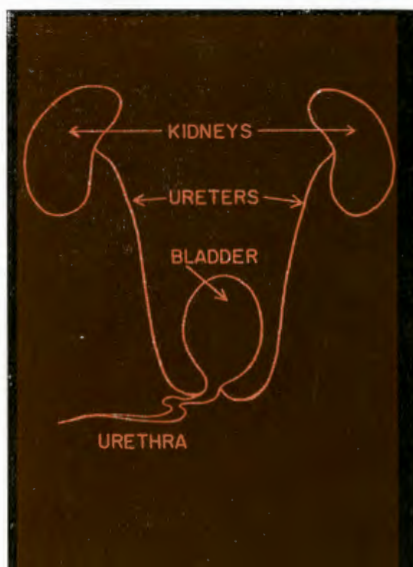
Experiments Conducted

Trial 1. An experiment was conducted in an attempt to determine

the cause of siliceous urinary calculi (calculi composed mainly of silica). Wether lambs were fed two types of rations, one containing prairie hay (high silica) and the other containing alfalfa hay (low silica). The balance of both rations was made up mainly of ground oats (high silica). Twelve lambs were fed on each ration and half of them were further supplemented with silica in the form of sodium silicate. This material was added as 1% of the ration.

None of the lambs receiving alfalfa hay in the ration developed calculi. On the other hand stones were observed in three of the lambs in the prairie hay fed group. Feeding additional silica as sodium silicate did not appear to have a significant effect on urinary calculi production regardless of the kind of hay fed. One of the lambs that developed calculi died of "water belly" and the stone was not found. Stones from the other two lambs were recovered at the time of slaughter. One was composed principally of silica, while the other was mainly calcium and magnesium phosphates.

Analysis of blood and urine sam-



ples showed that the calculi-developing lambs maintained higher levels of phosphorus in the blood and urine than did the calculi-free lambs. No significant differences were observed in the levels of any of the other urinary constituents or physical characteristics. The results of this experiment indicate that variations in phosphorus metabolism might play a role in the production of urinary calculi.

Trial 2. Because of the correlation between urinary calculi production and phosphorus excretion observed in Trial 1, another experiment involving 24 wether lambs was conducted. An extra source of phosphorus was added to prairie hay-oat rations. Supplements of calcium and combinations of calcium and phosphorus were also used. Two lambs from a group of six receiving extra phosphorus developed calcium and magnesium phosphate deposits which resulted in urine blockage and death. The addition of extra calcium to the high phosphorus ration appeared to be quite effective in preventing this type of calculi from forming. Small silica deposits were found at the time of slaughter in the kidneys of at least one lamb from each treatment group. The treatments used in this experiment appeared to have no effect, adverse or beneficial, on the formation of silica deposits.

Recommendations

Surgery is the most successful treatment for existing cases of urinary calculi. The relief afforded calculi-prone animals, however, may be only temporary.

No single preventative method has been devised for the preven-

tion of calculi. In general, applying the following rules should help minimize losses due to urinary calculi.

1. Provide an adequate water supply at all times. An adequate water intake helps to assure proper elimination of excretory products without creating an excessively concentrated urine. Encourage water consumption by keeping it clean, readily available, and warm in the winter. Quite often water consumption can be increased by feeding modest amounts of salt in the ration. Some experiment stations report that lambs perform satisfactorily on rations containing as high as 10% salt, though this level is probably higher than necessary. The amount of salt used should not be large enough to reduce consumption of the ration.
2. Supplement high concentrate rations (normally high in phosphorus) with a calcium source such as ground limestone when being fed for long periods to bulls, steers, rams, and wethers.
3. Feed good quality legume hay whenever possible. It is a good source of calcium and is also slightly diuretic.
4. If siliceous calculi have been previously encountered you may have to limit, or in some cases completely avoid, the use of high silica feeds.

By following these recommendations, you should minimize losses due to urinary calculi under most conditions. Due to the complexity of the problem, however, some calculi may occur regardless of the precautions you take. (Project 309. Station Biochemistry and Animal Husbandry Depts.)



the future of beef

A CHALLENGE TO BREEDERS

By C. A. Dinkel

THE GOAL OF the beef cattle industry is, and always has been, the production of high quality beef at the lowest possible production cost. While this goal does not change, our methods of achieving the goal need to change as we continue to improve our cattle and as the competition within the meat industry increases. All types of industry operating on a competitive basis are faced with this continual need for improvement in production efficiencies.

Recent estimates indicate that we might expect requirements for beef to increase nearly 50% during the next 20 years. While it is true that we will continue to have our cycles during these 20 years, the general trend over the period should be upwards with each succeeding high being higher than the preceding one and each low being higher than the preceding low.

It has been further estimated that only about one half of this increase can be obtained through increased

numbers of beef cattle. In other words, we must increase the yield of each individual animal by about 25%. Any way you look at it 25% more beef from each animal slaughtered is a large order. To fill this order it appears that every possible efficiency and every possible improvement available in the areas of management, feeding, breeding, marketing, and processing will be needed.

The breeders of beef cattle will play an important part in meeting this challenge. Recent research indicates that there is still room for selection to improve many of the characteristics that will be important in meeting the anticipated demand. Over-all industry requirements stated in a general way would include:

(1) A maximum amount of high quality lean meat distributed in as high a proportion as possible to the high priced cuts.

(2) Dressing percentage as high as possible to meet the packer's requirements.

(3) All of these goals without sacrificing the production traits so important to the feeder and breeder.

In fact, further improvements in these production traits will be necessary if we are to meet the anticipated demand. The feeder will require animals that gain faster and more efficiently, and the breeder will need animals with hardy constitution, high fertility, good mothering ability, and rapid growth rate.

With so many areas to satisfy, the job of the breeder is complex. Finding the breeding animals that will satisfy all of these demands is not easy. Some antagonisms may even exist whereby going too far toward satisfying one area might actually

be detrimental to another area. Research efforts in the field of beef cattle breeding are being directed toward establishing:

- (1) The relative importance of heredity and environment in determining the important beef traits.

- (2) The relationships among the many important traits of beef cattle in order to evaluate any possible antagonisms that might exist.

- (3) More efficient methods of selection which will help the purebred breeder in the selection of his breeding stock.

Research already completed has demonstrated the usefulness of, and the methods for, improving mothering ability and rate and efficiency of gain in our beef cattle. Some breed associations and most state Extension Services have established programs whereby breeders can participate in a performance testing program. These programs simply involve the keeping of records, usually taken in some uniform manner. Performance testing or the keeping of these records will be of no use, however, unless the records are used in the selection of breeding stock. As the work continues further improvements in these programs should be forthcoming.

Research information in the area of selecting for improved carcass traits is not as abundant as in the case of production traits. However, considerable research effort is being expended in this direction. Preliminary results indicate that heredity may play an important role in determining carcass merit and that there are very desirable animals being marketed today, animals that are superior in many of the traits that need

improving. It appears that the location and multiplication of the animals capable of producing offspring as good as our better animals of today will go a long way toward accomplishing what we need to do in the next 20 years. Probably our greatest need at this time is to find simplified methods of establishing which breeding animals will produce offspring of desirable carcass merit.

Beef has always enjoyed an enviable position in regard to consumer preference for meat. If consumers have the money to buy beef, they will buy it in preference to other meats. However, we should not forget what happened to the butter industry. If we do not provide sufficient beef at a price the increasing population can afford, we will be subject to the danger of losing a valuable part of our market. We should not lose sight of the need for continued improvement in a highly competitive field since the recovery of a lost market is a slow process.

This does not mean that we are being challenged severely by competition today. It means only that we should be looking for ways to keep far enough ahead of the competition so that we will not be severely challenged. Increased production with decreased costs through greater efficiencies is the goal we should be reaching for.

Moving towards this goal does not require radical changes in either our cattle or our operations. It does require, however, the adoption of methods of improving on each of these when these methods have been proven to be effective. (Animal Husbandry Dept., Project 167.)



ATTITUDES OF PEOPLE TOWARD EXPERIMENT STATION AND EXTENSION SERVICE

By John D. Photiadis

BUILDING EFFECTIVE and efficient institutions to serve the basic needs of man is one of the greatest problems in a changing society. A periodic check of institutional programs and their effectiveness can give intelligent direction to institutional building. The research this article reports does not specifically appraise the effectiveness of an institution, however, it does present one aspect of such an appraisal. In particular it deals with:

- (a) Attitudes of farm people toward the functions and contributions of the Experiment Station and the Extension Service.
- (b) Some characteristics of people who have more favorable or less favorable attitudes.

The Sample

The data were initially collected to secure a control and an observation group for a study dealing with the evaluation of the Farm and Home Development Program in Deuel County. With a slight modification of the initial sample, a random sample of 224 farmers and 136 farm wives was used to make possible an additional study dealing with adoption of farm practices and contacts with with agricultural agents. The information presented here has been secured from this sample.

What People Think About the Extension Service and the Experiment Station

Attitudes are not measured but are inferred from concrete responses to specific situations, natural or contrived. Thus, we infer a favorable attitude toward an institution when a person responds favorably to a series of questions regarding the function and contribution of this institution.

Seven such questions have been used in this particular inquiry. Responses to four of these questions are given on the next page.

People Who Have More or Less Favorable Attitudes

To secure a measurement of attitudes, we attempted to scale the attitude questions. Six of these questions were scaled; that is, they were found to measure the same dimension.¹ One question was omitted. By giving a single score to those who checked a favorable response to each question, we placed people on a continuum having at one end those with the most favorable attitudes, and at the other, those with the least favorable.

Three areas dealing with characteristics of people with different attitudes were investigated: (a) Personal and social characteristics, (b) Contacts with agricultural agents, (c) Effectiveness as farm operators.

¹Scaling is a technique developed to test the unidimensionality of a battery of questions. To test this unidimensionality a measurement called coefficient of reproducibility is used. Ninety percent reproducibility is required for a battery of questions to be considered as unidimensional. The six questions used in this study offered a coefficient of reproducibility higher than 90%.

Question: *In your opinion, does information from agricultural colleges and experiment stations concern you and your family?*

	men	women
Directly _____	62.5	65.7
Indirectly _____	29.9	29.8
Not at All _____	7.6	4.5
	100%	100%
Total cases _____	(224)	(67) ²

Question: *How much do you think experiment stations help farm people in the state?*

	men	women
Very much _____	45.5	35.8
Pretty much _____	48.2	62.7
Not very much _____	5.8	1.5
Not at all _____	0.5	_____
	100%	100%
Total cases _____	(224)	(66) ²

Question: *Do you think that the tax money supporting the various educational programs of the Department of Agriculture, (state or federal) is well spent?*

	men	women
I think it is well spent _____	68.7	64.7
I don't know enough to say _____	16.1	30.9
I don't think it is well spent _____	12.5	4.4
I think it is wasted _____	2.7	_____
	100%	100%
Total cases _____	(224)	(136)

Question: *How helpful do you think a well-informed county agent, Farm and Home Development agent, Soil Conservation agent or Agriculture Stabilization manager could be for a county in this state?* (Housewives were asked only about home agent.)

	men	women
Extremely helpful _____	28.1	19.2
Very helpful _____	45.5	57.8
Helpful _____	24.1	21.5
Very little help _____	1.3	1.5
Not helpful _____	1.0	_____
	100%	100%
Total cases _____	(224)	(135)

Personal and Social Characteristics

Factors such as size of farm, ownership, number of acres in crops this year, value of livestock, level of living, and net worth were found positively but not significantly related to attitudes toward the Extension Service and the Experiment Station.

Money invested in farm machinery was quite close to being significant at the 5% level, which is the minimum level of significance required for this study.³ Age and size of family were found negatively but also not significantly related to attitudes. Education and gross farm income were the only two factors significantly and positively related to these attitudes (see table 1).

Contacts with Agricultural Agents

This study indicates that the more people come in contact with agricultural agents, the more favorable attitudes they have toward the Extension Service and the Experiment Station. Frequent contact with any specific agricultural workers in the country, such as county agent, Soil Conservation agent, ASC office manager, and Farm and Home agent, were found related to favorable attitudes. However, frequent contacts with the county agent were found more related to favorable at-

²Before this question was asked, homemakers were requested to answer an essay question about the Experiment Station and its function. Those who were found not well informed on the matter were not questioned further.

³By 5% level of significance we mean that there is a probability of less than 5 in 100 cases that this relationship is due to chance. This probability is measured through the use of X^2 . One degree of freedom is used for all relationship in this paper.

Table 1. Relationship between Education and Gross Farm Income and Attitudes toward the Experiment Station and Extension Service

	Attitudes	
	more favorable (Score 4-6)	less favorable (Score 0-2)
Year in school		
more than 8	61%	31%
8 or less	39%	69%
	100%	100%
Total cases	(79)	(138)
Gross farm income		
	$X^2=17.15$, Sign. 1%	
more than \$10,000	49%	42%
\$10,000 or less	51%	58%
	100%	100%
Total Cases	(92)	(83)
	$X^2=9.42$, Sign. 1%	

titudes than contacts with any of the other agents in the country.⁴ Table 2 shows the relationship between contacts with all agents combined and attitudes toward the Experiment Station and the Extension Service.

Each specific contact, such as farm visit, or circular letters was related to attitudes the same way.

People were asked to mention the sources from which they received the most helpful information. Those who mentioned different contacts as

Table 2. Relationship between Contacts with All Agricultural Agents and Attitudes toward the Experiment Station and the Extension Service

	Attitudes	
	more favorable (Score 4-6)	less favorable (Score 0-3)
Contact with all Agricultural Agent		
high	61%	16%
low	39%	84%
	100%	100%
Total Cases	(94)	(126)
	$X^2=49.418$, Sign. 1%	

sources of information were found to have different attitudes. Those who mentioned as sources of most helpful information individual talks with the county agent, Extension meeting and demonstrations, and reading South Dakota State College bulletins were the ones who had the most favorable attitudes toward the Extension Service and the Experiment Station (see table 3).

Relationships similar to those between contacts with agricultural agents and attitudes were found be-

⁴Amount of relationship for comparison purposes throughout this paper was measured with Phi coefficient, a measure that shows the amount of association which exists between two variables.

Table 3. Relationship between Three Mentioned Sources of Helpful Information and Attitudes toward the Experiment Station and the Extension Service

		Attitudes	
		more fav. (Score 4-6)	less fav. (Score 0-3)
Helpful information from:			
Individual talks with the County Agent	yes.....	(97)	(126)
	no.....	48%	81%
	Total Cases	(97)	(126)
$X^2=36.433$, Sign. 1%			
Extension Group meetings and Demonstrations	yes.....	71%	28%
	no.....	29%	72%
	Total Cases	(78)	(144)
$X^2=26.107$, Sign. 1%			
South Dakota State College Bulletins	yes.....	77%	44%
	no.....	23%	56%
	Total Cases	(97)	(126)
$X^2=21.555$, Sign. 1%			

**Table 4. Relationship Between Formal Participation and Attitude
Toward the Experiment Station and the Extension Service**

Participation in farm organization	Attitudes		Total formal Participation	Attitudes	
	more fav.	less fav.		more fav.	less fav.
high	62%	30%	high	62%	34%
low	38%	70%	low	38%	66%
Total Cases	(91)	(117)		(95)	(128)
	$X^2=20.81$, Sign. 1%			$X^2=16.99$, Sign. 1%	

tween contacts with formal organizations are the ones who have the most favorable attitudes toward the Experiment Station and the Extension Service (see table 4).

Effectiveness as Farm Operators

Effectiveness is used in this article to show adoption of recommended farm practices, knowledge about farming, and attitudes toward recommended farm practices. All three—adoption (which is measured with 22 questions), knowledge (which is measured with 19 questions) and attitudes toward the farm practices (which is measured with 9 questions)—have been found significantly and positively related to attitudes toward these two institutions. Table 5 shows the relationship between these three variables combined and attitudes toward the Extension Service and the Experiment Station.

Table 5. Relationship Between Total of Adoption, Knowledge, and Attitudes Toward Farm Practices and Attitudes Toward the Experiment Station and the Extension Service

Total of Adopt., Know. and Att.	Attitudes	
	More favorable	Less favorable
high	70%	44%
low	30%	56%
Total Cases	(139)	(84)
$X^2=14.461$, Sign. 1%		

Conclusion

With few exceptions, people have expressed favorable attitudes towards the function and contribution of the Experiment Station and the Extension Service. However, some have expressed more favorable attitudes than others.

Those who have less favorable attitudes come in least contact with agricultural agencies and farm or nonfarm organizations and have less formal education. They adopt fewer new farm practices, have more limited knowledge about farming in general, and have less favorable attitudes toward new practices. The more efficient farmers (not necessarily "big" farmers), have more favorable attitudes. Those who mentioned personal contacts with extension agents, extension meetings and demonstrations, and South Dakota State College bulletins as sources of most helpful information, were the ones with the most favorable attitudes.

For such an evaluation to be completed, depth interview questionnaires should be administered to these individuals located at the two ends of the attitude continuum. Such an investigation would reveal more realistic causes of favorable or unfavorable attitudes. This knowledge would be valuable for more efficient planning. (Project 332, Rural Sociology Dept.)