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Geo. Gilbertson, B.S., M.S. .......................................... Assoc.

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Sherman Johnson, B.S., M.S. ......................................... Agricultural Economist
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Paul H. Landis ........................................................ Asst.

Veterinary

C. C. Lipp, D.V.M. ...................................................... Veterinarian
J. B. Taylor, D.V.M. ................................................... Asst.
Mr. C. Larsen
Dean of Agriculture

Dear Sir:

The following is the Annual Report of the South Dakota Agricultural Experiment Station, as required by law, for the fiscal year ending June 30, 1932.

Mr. Paul H. Landis was added to the personnel of the staff in the capacity of assistant in the department of Rural Sociology.

There were thirteen publications printed as follows:

Bul. 263 The Shrubs and Climbing Vines of South Dakota
Bul. 264 Emmer (Speltz) for Dairy Cows
Bul. 265 A Comparison of Alfalfa, Sweet Clover, and Sudan Grass as Pasture Crops for Dairy Cows
Bul. 266 Essentials in the Success of a Local Cooperative Creamery
Bul. 267 Destroy the Grasshopper Eggs
Bul. 268 Spring Wheat Varieties for South Dakota
Bul. 269 Freight Rates and the South Dakota Farmer
Bul. 270 Variations in Amounts of Carbohydrates in the Leaves of Corn
Bul. 271 Rye as a Fattening Feed for Cattle and Swine in South Dakota

Circ. 2 Indebtedness on 48 Potter County Farms
Circ. 3 Preliminary Report Feeding Flax Straw to Cattle
Circ. 4 Farm Real Estate Mortgage in Hyde County
Circ. 5 Mortgage Loans on Farm Real Estate in Haakon County

There were about 32879 bulletins sent to addresses within the state, 12200 to parties in other states and 4025 to foreign countries, making a total of 49104 bulletins distributed during the year.

For a detailed statement of work I refer you to reports from chief of each department.

Yours truly,

J. W. Wilson
Director of Experiment Station
Agricultural Economics
By Sherman Johnson

The research work of the department is supported entirely by Purnell funds. The active projects may be classified into the following lines: (1) Economics of Production, (2) Marketing, (3) Prices, (4) Finance, (5) Transportation, (6) Land Values.

Studies in Economics of Production

In this field the main activity during the past year has been concentrated on a study of farm organization in the major wheat growing area of South Dakota. Records of production operations on about 150 farms were started in the spring of 1931. In January, 1932, these farmers began keeping records of receipts and expenses. This study is planned for a three year period. Field visits to the cooperators are made three times a year.

The area covered in this study includes Potter County, where a more detailed study was carried on during the year 1930. Hence for a part of the area, continuous records will be available for over a four year period. It is also hoped that when the research study is completed many of the farmers will wish to continue with their records and that they can be carried as cooperators in extension work. In this way continuous farm management information will be available to the college, which will furnish a sound basis for extension work in this field.

The results of the Potter County study dealing with financing of farm operations are now in publication. The records on farm power units secured in Potter County have been merged with those secured from the larger wheat area study in 1931. These results are now nearly ready for publication. It is planned to prepare reports on hog production and also on general problems of farm organizations in Potter County during the coming year.

Records of cattle ranch organization in western South Dakota have been kept on a small group of ranches during the year. This study continues the work published in Bulletin No. 255, Cattle Ranch Organization and Management. The aim is to secure data of value in planning ranch organizations from a longer time viewpoint.

Another project in the field of economics of production aims at studying the risk factor in agricultural production. During the past year crop yield data by counties have been tabulated from the records of the state statistician and a considerable amount of crop yield information has been collected from private sources. Rainfall records for points in South Dakota where long continuous series are available have also been summarized. It is hoped that from a study of these records more reliable information can be developed on the risk due to weather conditions in different areas of South Dakota.

Studies in Marketing

The research work in marketing has so far been confined to a study of cooperative elevator management, financing and organization. This study is divided into two phases: (1) a historical study of farmers' elevators, and (2) a detailed study of current operating practices. The work on the latter phase of the project has been carried on in cooperation with the Division
of Cooperative Marketing, Federal Farm Board and the states of Minnesota, North Dakota and Montana.

Analysis of data obtained from this study is nearing completion and a manuscript will be submitted this fall.

Studies in Prices

The work in this field has been confined largely to keeping the index of South Dakota farm prices up to date. There are a great many inquiries for this information at the present time and it is hoped to publish a release on the index of South Dakota farm prices and "purchasing power" in the near future. Plans are being made at the present time to compile a series of prices paid to producers in the wheat area of South Dakota. Eventually it is hoped to establish farm price series for different types of farming areas.

Studies in Agricultural Finance

Farm mortgage data have been tabulated from the county records for selected townships in Brooking, Clark, Haakon, Hyde and Turner counties. These tabulations show the trend in the mortgage and foreclosure situation from 1910-1930. A preliminary report on Brookings County was mimeographed in 1930 as Circular No. 15. Reports on Hyde and Haakon counties are now in press.

Summaries show increasing volumes of delinquencies and foreclosures. Partly as a result of forced liquidation, the tendency is toward a decreased volume of mortgages and a declining acreage of mortgaged land. Information available from these studies furnishes a foundation for a long time policy directed at gradual improvement of the terms and conditions under which farm mortgage credit is extended.

Some time has also been devoted to a study of the lending experience of insurance companies operating in South Dakota. Information has also been gathered on the extent of farm foreclosures in different counties of the state.

Studies in Transportation

The recent work in transportation has been divided into two phases. The one phase deals with the incidence of transportation rates and the effect of their changes on farm prices and on types of farming. A bulletin is now being published on this aspect of the problem. The results bring out the economic importance to established farming areas of changes in the freight rate structure.

The second phase deals with motor truck transportation in nine western South Dakota counties. This study analyzes the history and development of trucking in this area with respect to agencies engaged in trucking, distance hauled, source of haul, earnings, etc. Commercial hauling is an important form of transportation in this area. Long average hauls predominate. A manuscript on this study is now being completed and will be submitted for publication shortly.

Studies in Land Values

During the past year a study has been started with the purpose of gathering and analyzing data on land values with the hope of providing a sounder basis for reestablishing a real estate market in South Dakota. This study was begun in Brown County and records have been obtained
on over 2,500 transfers covering a period of 14 years. Since there is almost a complete lack of reliable information on this subject, the results should prove valuable to farmers, mortgage agencies, bankers and taxing bodies.

Agricultural Engineering
Corn Harvesting Machinery  (Purnell)

By Ralph Patty

The purpose of this project was to build a machine that would husk snapped corn and elevate it into the crib. This is to be used with corn snapper machines that are already on the market or that may be built for the trade. The advantage of this machine and of this method of harvesting corn is to increase the speed of harvesting corn, to save the power that is required to pull the heavy husking bed of the picker-husker back and forth across the field, and at no extra cost, to salvage the corn husks that are thrown on the ground by the picker-husker and blown into the fence row.

The husker elevator machine was finished and used last year. Work was done on the improvement of the machine during this year and preparations begun for measuring all the power requirements in connection with its use. This fall the machine husked and elevated corn at the rate of 150 bushels per hour or practically as fast as a portable elevator would elevate it. It will more than keep two two-row snapping machines going in the field. Improvements and power requirements will be studied during the coming year.

The Use of the Combine Harvester-Thresher  (Purnell)

The work on this project for the season of 1931 was very unsatisfactory owing to drought. The phase of the study we expected to make was the effect of weeds in the use of the combine. The grain was too short and the season too abnormal to do any effective work. About 30 acres of short oats on the college farm was harvested with the windrower and pick-up attachment. The work will be continued in a normal year.

“Rammed Earth” for Farm Building Walls  (Purnell)

Work on this project has continued actively throughout the year. With the study of optimum sand content in the clay and the optimum moisture content in the soil before ramming practically completed, the work this year has been a study of weathering of different soils, of coverings for protecting “rammed earth” walls and the building of a small experimental “rammed earth” building. Twenty-three additional weathering walls (test walls) were constructed during the year in which a search is being made for the optimum consistency of materials for weather resistance. In a series with varying moisture content only, the dry mixtures are showing poor resistance to weathering but results on the wetter mixtures are not yet apparent. It is evident that 30 per cent or more of sand (over a 200 mesh screen) is desirable if not necessary to weather resistance. The sand is necessary to absorb the shrinkage stresses and thereby avoid excessive checking of the walls as they dry out.

Driving rains have a tendency to wash the earth walls. The study so
far would indicate that protective coverings are desirable if not absolutely necessary, as a good practice, for this type of construction. A study of protective coverings was started immediately after July 1 with the following results to date:

Cement plasters are all showing up as an excellent covering, with or without an expanded metal base. "Dogga plaster" is showing very good but with a very slight tendency to show a bit rough on the surface.

Linseed oil paint applied after a sizing of linseed oil has shown a perfect covering so far.

The following coverings indicate a possibility of fair value as a protective covering: Liquid asphalt, a cold asphalt preparation thinned with three volumes of water and applied in two coats, creosote oil applied in two coats, raw linseed oil, and crank-case oil.

The following coverings proved altogether unsatisfactory: white wash in all forms, portland cement cream, water glass NaSiO₃, gasoline and paraffin solution, and asphaltum—another prepared asphalt preparation.

Since the primary purpose of this study is to determine the value of "pise" construction for poultry house walls in the north central climate, a small experimental house was built in which trials were made with tight construction features, blocks for nailing, window lintels, and plate and roof features.

The construction of a poultry house with "pise" walls is well started and will be completed this coming year. It will also be carefully checked against two other types of similar houses and the moisture and frost indications compared when housing the same number of birds.

The Comparative Length of Service of Galvanized Steel Posts and Painted Steel Posts. (Station Local)

This study is a comparison of the serviceability of galvanized steel posts and painted steel posts. Steel posts of the same brand were used in this test. The posts were 6 feet 6 inches long and were identical in every way except that 500 of them were galvanized and 500 were painted with a drab colored paint. They were set in the fence 15 feet on center in the fall of 1925. The fences are around the College farm and the posts carry an extra heavy woven wire fence 48 inches high, with heavy concrete corner posts. The posts were driven to exactly the same depth and with identical exposure.

This year's inspection showed 50 per cent of the paint gone from the painted posts and rust appearing where the paint is missing. No flaw or rust spot was found on any of the galvanized posts. The color of the galvanizing is slightly dulled but is entirely intact. The paint on the posts does not show signs of scaling or flaking in large pieces but starts rust in small spots that cover the post quite uniformly. Deterioration of the paint is the same along the post from top to bottom, but the paint on the north side is better than on the south. The appearance of the painted posts at the end of seven years is badly injured.
Agronomy
Soil Fertility  (Adams)
By A. N. Hume

A long time project on the influence of rotation upon the maintenance of soil fertility involves the use of a definite rotation with fertility treatments.

The field work was carried out according to project. Determinations of total calcium, magnesium, sulphur, and phosphorous were made on the samples from the twenty plots involved in this project.

The results of the first twenty years investigations, 1908 to 1927 inclusive, have been carefully summarized, and tables prepared for publication. The full text for a bulletin reporting the first twenty years results will be completed within a very short time.

The application of phosphorous still gives the greatest increase in yields.

Carbohydrate Variations  (Purnell)

This project has been summarized during the fiscal year just closed and published as Experiment Station bulletin 270, by Leo F. Puhr and A. N. Hume. Following is the summary:

1. The total sugar in the leaves of early and late maturing strains of corn increases rapidly during the day time and decreases at night. The maximum amount of sugar for both strains occurs from 1:00 p. m. to 4:00 p. m. The minimum amount of total sugar in the leaves is found between 1:00 a. m. and 4:00 a. m.

2. The insoluble carbohydrates estimated as starch reach a maximum later in the day than the total sugar. For most observations the maximum amount of insoluble carbohydrates was found between 7:00 p. m. and 1:00 a. m., and the minimum amount at approximately 4:00 a. m. to 7:00 a. m.

3. The non-reducing sugars were always in excess of the reducing sugars. The non-reducing sugars increased rapidly during the hours of sunshine and decreased at night. The variations in reducing sugars are not so well defined and regular as the variations in non-reducing sugar.

4. There is no significant difference between the early and late maturing strains of corn here employed in regard to the daily variation and quantity of sugars and starch in the leaves.

Cereal Breeding for Rust Resistance  (Purnell)

During the past year fifty-three hybrids were for the first time grown in the cereal breeding nursery for purposes of evaluating their respective yielding capacities. Most of these hybrids are the result of crosses between varieties of hard red spring wheat and black stem rust resistant types, such as Marquis x emmer and Hope. It will require several years definitely to test out these various hybrids for their disease resisting characters and respective yielding abilities.

The fourth generation of winter wheat hybrids is now being grown. They will be included in the yield nursery this fall. In the winter wheat breeding work crosses were made between varieties having good agronomic characteristics and very winter-hardy types such as Buffum and Odessa. Some good appearing hybrids have been produced. It will require several seasons to evaluate these various hybrids for winter hardiness and yielding ability.
In a study of the inheritance of earliness in spring wheat, earliness was found in all cases to be completely dominant over lateness in heading and in time required for maturity.

**Phosphorus and Sulphur (Adams)**

A project was designed to define accurately the effects of phosphorus in different forms on the growth of plants, and the effect of sulphur in combination with calcium carbonate (gypsum, calcium, sulphate), and pure sulphur on the growth of plants.

Greenhouse cultures have been conducted for the year 1932. Acid phosphate and treble phosphate gave the largest increase in yield of wheat, although all cultures gave very satisfactory results this year.

**Corn Rots (Adams)**

Investigation of corn rots and diseases has been continued with the use of numerous selfed strains. Tabulations are being made to establish possible correlations between various strain characters and also between these characters and the appearance of certain diseases, for instance, root rots and smut.

In the present season S7 strains are available, and also crosses of the same.

**Weed Eradication (Hatch and Local)**

Eradication of creeping jenny, Convolvulus arvensis, is being studied experimentally. During the year just closed applications of calcium chloride in the form of dust spray have proved successful in one instance in eradication at Brookings. One infestation of creeping jenny was sprayed three times at intervals with a solution of one pound of calcium chloride per gallon of water; once at blossom stage of the plants, and twice thereafter. Remaining plants in the same infestation were sprayed the following season. This method of eradication proved effective.

Cultural methods of eradication are being tried with several variations, including variation in depth of plowing of five and eight inches; and also many times of cultivation thereafter. Merely stirring up the ground as a sole method of creeping jenny eradication has not proved effective in this experiment.

**Crop Rotations (Hatch)**

Crop rotation experiments have been continued for many years at Brookings. A summary of crop yields which this department hopes to compile as early as possible will constitute statistical data measuring the variations of yield due to season and soil and environmental conditions to which crops are naturally subjected. Such data may furnish a scientific basis for other discussion.

The widest variations due to differences in crop rotation seem to be effected by weed populations.

Thus a study of crop rotations coordinates with studies in weed eradication.

**Flax Investigations (Flax Scholarship)**

Flax investigations have included tests of several varieties with a view to observing one or more which may be free from diseases, especially flax wilt and rust. Up to date the variety Buda has proved most dependable. Another investigation which has been conducted covering several sea-
sons is spacing of the flax plant. This investigation grew out of claims formerly made for so-called “bush” flax. Observations indicated that the so-called “bush” character of flax which was one characteristic of the variety mentioned could be correlated with spacing or distance apart of plants.

During the year a paper has been contributed by K. H. Klages, entitled “Spacing in Relation to the Development of the Flax Plant.” Jour. Am. Soc. of Agronomy, Vol. 24, No. 1, January, 1932.

Substations: Highmore, Eureka, Cottonwood, Vivian (State)

During the year crop yields have been summarized covering nineteen growing seasons at Highmore experiment farm. These are submitted for publication as an experiment station bulletin. Limited conclusions are drawn to the effect that the most successful practical rotation from the standpoint of crop yield and consequent income in the area represented consisted of a three-year cropping system: (1) cultivated crop (corn); (2) small grain crop (cereals or flax); (3) legume (sweet clover). The tabulated yields, however, will not only serve as a basis for direct conclusions but also forage statistical data which may be used as a basis for scientific discussion of crop returns.

Similar investigations are being carried out at the other experiment farms, and at Brookings, with a view to making them available in similar fashion.

Seed Testing (State)

The seed laboratory tested 3443 samples of seeds, and 365 weed specimens were identified.

Potato Investigation (State)

A limited state appropriation is available for the specific purpose of potato investigations. This is supplemented with the use of Hatch funds and Local.

Tuber index and tuber unit work is being carried on with three varieties, namely, Irish Cobbler, Early Ohios, and Triumphs. In addition twenty different varieties are tested for their adoption to South Dakota conditions.

Experiments are also in process dealing with the control of insect pests by spraying.

The following list of bulletins and circulars have been issued during the past year by members of this department:

Bul. 272 “Crop Yields over Nineteen Years at Highmore Experiment Farm.”

Bul. 270 “Variations in Amounts of Carbohydrates in Leaves of Corn.”

Bul. 268 “Spring Wheat Varieties for South Dakota.”

“Abstract of Addresses and Discussions of Second Annual Soil and Land Valuation Conference.” (mimeographed)


Animal Husbandry
By James W. Wilson

Rations for Spring Pigs After Weaning
(Hatch and Station Local)

To determine the value of putting pigs on pasture crops. There were five lots as follows: Smooth awned barley; smooth awned barley and rape; oats and rape; oats and field peas, and early dent corn. Due to the dry weather the yields of grain were under average and poor results were obtained.

How Can Soybeans be Fed with Corn to Avoid Soft Pork?
(Purnell)

Five bunches of pigs were fed in dry lots on various forms of soybeans with corn, tankage, alfalfa hay and minerals. When pigs reached 225 pounds weight, they were killed in the college abattoir. Then, cooled carcasses were graded as to firmness and samples taken for chemical analysis.

The Value of Oil of Chenopodium in the Treatment of Pigs Affected with Worms (Purnell)

This is a cooperative experiment between the division of pharmacy and the department of animal husbandry. Four lots of pigs were used in the experiment. These pigs had purposely been infested with worms.

Pigs of Lot I were not wormed. Pigs of Lots II and IV were treated with oil of chenopodium twice, and those of Lot III were treated once.

The results of the last experiment show that when pigs are badly infested worming them once reduced the amount of feed required to make 100 pounds of gain. These results show no advantage in worming twice.

The Value of Ground Flax in the Production of Pork
(Station Local and State)

Forty-eight head of pigs, farrowed in the fall of 1931, were used in this experiment. They were fed in six different lots of eight head each on the following supplements—ground flax, tankage; tankage 2 parts and linseed oilmeal 1 part; linseed oilmeal and ground flax 1 part and tankage 2 parts by weight. All pigs received shelled corn in addition to alfalfa
hay and a mineral mixture. All feeds were self-fed. It is the intention to repeat this experiment several times.

Value of Ground Flax and Ground Soybeans in the Production of Baby Beef. (State)

The object of this experiment is to ascertain the value of adding as a supplement these oil seeds, commonly produced in this state, to a ration of shelled corn and alfalfa hay, as compared to adding their by-products; namely, linseed oilmeal and soybean oilmeal.

Twenty-five calves were divided into five lots of five head each and fed for a period of 146 days. Calves of Lot I on a ration of shelled corn and alfalfa hay made an average gain per head daily of 2.35 pounds. Those of Lot II receiving shelled corn, linseed oilmeal made a return of 2.32. Those of Lot III that received ground flax with the shelled corn and alfalfa hay made an average daily gain per head of 2.48. Those of Lot IV receiving soybean oilmeal made an average daily of 2.38 and those of Lot V that received ground soybeans with their shelled corn and alfalfa hay made an average daily gain of 2.39 pounds. The intention is to repeat this experiment before publishing results in bulletin form.

Methods of Feeding Lambs

The object is to determine the value of self-feeding or hand-feeding with both whole and ground feeds.

For this experiment 84 lambs, of different breeds, raised by the animal husbandry department of the college, were divided into six lots of 14 head each and fed for 89 days the following rations and in the following manner:

Lot I. Shelled corn and alfalfa hay—hand-fed.
Lot II. Shelled corn and alfalfa hay—self-fed.
Lot III. Ground corn and ground alfalfa hay—hand-fed.
Lot IV. Ground corn and ground alfalfa hay—self-fed.
Lot V. A mixture of 100 pounds whole oats, 100 pounds of shelled corn and whole alfalfa hay—hand-fed.
Lot VI. A mixture of 100 pounds of whole oats, 100 pounds of shelled corn, 25 pounds of linseed oil meal and whole alfalfa hay—hand-fed.

Largest gains were received from lambs in Lots V and VI, being an average of .44 and .45 of a pound per head daily. This experiment will be repeated.

Sheep Breeding (State)

There were two experiments under this heading. (a) Will fine, soft-fleeced Karakul sheep produce lambs with pelts superior to coarse-fleeced Karakul sheep? This is the first year of this investigation and the intention is to continue over a period of years. Samples of wool, in three different parts of the body of all the pure-bred and grade Karakul ewes, were taken and will be measured for size and length of staple. Records were made of each lamb at birth.

(b) Breeding to Eliminate the tail. By selection for several years I have been able to produce a strain of sheep with good fleeces, open faced, and more vigorous than any of the pure-bred breeds we now have. Eighty-eight per cent of the 1932 crop of lambs did not need to have tails cut off. Several had no tails, others short tails and only a few with natural tails.
I believe that in time a strain will be developed here that will eliminate nearly all tails by using on any breed of sheep.

Fattening Summer Pigs on South Dakota Grains (State)

Forty-eight pigs were divided into six different lots of eight head each and fed on the following rations: Lot I, shelled corn and tankage; Lot II, ground rye and tankage; Lot III, ground rye and ground corn mixed equal parts by weight and tankage; Lot IV, ground rye and ground barley mixed equal parts by weight and tankage; Lot V, ground wheat and tankage, and Lot VI, ground wheat, ground barley mixed equal parts by weight and tankage. All lots were fed in self-feeders and received in addition alfalfa hay and a mineral mixture.

The ground wheat had a feeding value a trifle higher than shelled corn while the ground rye had a feeding value approximately 10 per cent lower than shelled corn. Mixing ground barley with ground rye increased the efficiency of the ration.

Feeding Alfalfa Screenings with Grains and Hay to Lambs at Newell Station (State)

This was in cooperation with the federal station at Newell. There were 56 high-grade Hampshire lambs in this experiment. They were divided into four lots of 14 head each.

Lambs in Lot I received barley and alfalfa hay.
Lambs in Lot II received barley 85%, screenings, 15% and hay.
Lambs in Lot III received barley 70%, screenings 30% and hay.
Lambs in Lot IV received barley 50%, screenings 50% and hay.

Lambs of Lot I made the largest gain, .41 pound per head daily, while those of Lot IV made the smallest gain, .35 pound per head daily. The cost of gain was the lowest with lambs in Lot I.

When the grain ration was replaced with alfalfa screenings more hay was consumed in each case.

Before printing it is desirable to do further work along this line.

A second experiment in cooperation with the federal station at Newell is fattening lambs to determine the value of sugar beet pulp with grains. During the winter of 1932 six hundred lambs were divided into six lots of 100 head each and fed as follows: Lot I, shelled corn and alfalfa hay; Lot II, alfalfa screenings, barley, pressed beet pulp and alfalfa hay; Lot III, barley, beet pulp and alfalfa hay; Lot IV, whole oats, beet pulp and alfalfa hay; Lot V, whole wheat, beet pulp and alfalfa hay; Lot VI, whole wheat, whole oats (equal parts by weight), beet pulp, beet tops and alfalfa hay.

The intention is to repeat this experiment in 1933 and 1934 when results of the three years work will be published in bulletin form.

Chemistry

By K. W. Franke

Alkali Disease Project (Purnell)

From the feeding of affected foodstuffs it was determined that the causative agent is present in the protein fraction of the foodstuffs. The protein from this affected grain is being treated in various ways in the attempt to isolate the toxic compound present. Studies on the blood are being made to determine if the toxic action is similar to those toxic actions.
already known. The feeding of various supplements such as vitamins, minerals and absorbents does not counteract the toxic factor. For the result of the cooperative work with the poultry department see report of the poultry department.

**How Soybeans Can be Fed with Corn to Avoid Soft Pork**  
(Cooperative with Animal Husbandry Department)  
(Purnell)

Analyses of feeds fed and the extraction of leaf lard and back fat has been completed. Refractive index determinations are now being made.

**Combine Harvester Project**  
(Cooperative with the Agricultural Engineering Department)  
(Purnell)

Fifty-eight moisture determinations for this work were made. For results see the agricultural engineering department report.

**Comparative Metabolism of Several Calcareous Materials in Poultry Feeding**  
(Cooperative with the Poultry Department)  
(Hatch)

As the analyses of these materials did not give any clue as to why they should differ, physical-chemical tests are now being made, such as: solubility in water, and acid solutions corresponding to the stomach contents of the chicken. As this experiment is not yet completed for this year's work, no conclusions can be drawn except those as noted by the poultry department.

**Dairy Husbandry**  
By T. M. Olson

**Comparison of Sweet Clover, Alfalfa and Sudan Grass Pastures under South Dakota conditions**  
(Purnell)

This is the sixth pasture season. The alfalfa plots were killed out last summer due to drought, hence we have no alfalfa pasture this year. The sweet clover and sudan grass pastures are very good.

Rye pasture was added this spring as an early pasture. The results were very good. It is planned to continue the rye pasture as a part of this experiment.

Because the college dairy herd was separated into positive and negative herds on the basis of the abortion test, we did not have enough negative cows to utilize all the plots.

It is felt because of the relatively low rainfall for the five years from 1927 to 1931 that the data did not indicate the relative or absolute value of these pastures, and therefore should be continued.

The data from the first five years have been written up in Bulletin 265. The following are the important conclusions:

1. Sudan grass is a short season pasture crop, but during the time it furnishes pasture it will carry more cows per acre and therefore produce more milk and fat per acre than either alfalfa or sweet clover.

2. Sweet clover ranks somewhat higher than alfalfa in the number of cow days produced per acre and in the amount of milk and butterfat produced per acre.
3. Cows lost most weight on Sudan grass, sweet clover being next, and least weight was lost on alfalfa pasture.
4. Sudan grass pasture seems to be the most palatable and sweet clover the least. The cows would clean up quack grass and other weeds before eating the sweet clover.
5. No trouble with bloat was experienced on either sweet clover or alfalfa.
6. Cultivated pastures are profitable under South Dakota conditions.

Amino Acid Titration as a Measure of Quality in Dairy Products (Hatch)

Twenty-seven churnings have been made from cream of various grades. Two 10-pound tubs were filled from each churning. One tub was kept in storage in the creamery refrigerator, and one tub was sent to a federal butter grader to be stored and graded fresh and after three and six month storage intervals.

The cream, butter, milk and fresh butter were analyzed for amino acid content, in order to study the relation between the condition of the cream and the final butter score. The butter was also analyzed for amino acid content after one, three and six month storage periods.

The six months storage period on the last churning is now being completed.

A preliminary survey of the data indicates that in general the cream samples of greatest amino acid nitrogen content makes butter of lower score. The amino acid nitrogen in butter also increases as the storage period progresses. Complete scores on storage are not yet available but present indications are that the butter of greatest amino nitrogen content deteriorates most rapidly.

Cost of Delivering Milk in Small Cities with Horse-Drawn and Gas-Propelled Vehicles (Station Local)

Operating costs have been kept on these two types of delivering milk over a period of years. Other considerations, such as time to cover route; service to patrons; effect upon type of labor employed are important.

The data to date have shown the gas-driven truck to be more economical. However, the personal factor has been very important in this connection. The milk man is not only a careful driver, but understands cars, and looks after the truck himself; hence the repair and upkeep have been unusually low.

The route can be covered in less than half the time with the truck, which makes possible a considerable saving in labor. The truck also necessitates less walking for the milk deliverer, and more satisfactory service.

Ice Well (Station Local)

This is a cooperative project with the agricultural engineering department.

Considerable difficulty was experienced in getting ice in the well despite the cold weather prevailing last winter. The water drained away before the bottom was covered with ice.

A record was kept of all water run into the well, as well as temperatures.

A block of ice two feet thick was formed but melted rapidly when warmer weather approached so that no experimental data was obtained.
Other methods will be tried to freeze a larger block of ice without the use of such large quantities of water. Observations indicate that the ice well is not a practical means of refrigeration under South Dakota conditions.

Skimmilk with Foam vs. Skimmilk with no Foam for Dairy Calves (Station Local)

Three trials have been conducted in which calves have been allowed the foam which normally gathers on separated milk. In two trials the calves were fed not only the foam which normally collects on the quantity of milk fed the calves, but the foam skimmed off from the milk fed the no-foam calves. In other words, the calves receiving the foam were fed twice as much foam as would regularly collect on the amount of milk fed.

No bad effects were noted from the foam, except temporary bloating immediately after drinking the milk. One would expect this to occur, as the calf takes into its system considerable air in the foam.

So far as increase in weight, height at withers, and physical appearance are concerned no deleterious results from foam were apparent. It would seem an entirely safe practice to allow calves to drink the foam provided they are given a definite amount by weight of skimmilk and foam. If calves were allowed to drink large quantities of skimmilk and foam there would no doubt follow digestive disturbances.

The data are being prepared in bulletin form.

Ammeter and Pressure Gauge Comparisons in the Operation of the Viscolizer (Station Local)

Results indicate considerable variation in the electric measuring devices, as well as in the pressure gauge. Neither of these devices is a definite and accurate measure of the pressure under various conditions of operation of the viscolizer. The ammeter, however, seems to be more accurate than the pressure gauge in indicating the pressure of operation.

Value of Sweet Clover Hay vs. Sweet Clover Pasture for Dairy Cows (Station Local)

The purpose of this trial was to compare milk production from sweet clover hay with that of sweet clover pasture on a given area of land.

The results were computed on a nutrient basis. On this basis the hay produced 57.8 pounds of protein, 350 pounds of total digestible nutrients per acre in the form of milk.

The pasture on the same basis produced 94.5 pounds of protein and 759.9 pounds total digestible nutrients per acre in the form of milk.

These results are approximations only as they are computed. However it seems very probable that more nutrients expressed in terms of milk production can be obtained from pasture than from an equal area on which the sweet clover is cut for hay.

Oatmeal Mill Feed vs. Wild Hay for Dairy Cows (Station Local)

One 120-day feeding trial has been completed. Another trial will be conducted this winter. The oatmeal mill feed was used as a roughage, it being the only roughage fed during the trial.

The cows in the first trial were allowed all the roughage they would clean up. The data indicate that they ate more pounds of oatmeal feed
The cows on the oatmeal feed gained faster in body weight. In the second trial the roughage will be limited to the maintenance requirements. When the cows were allowed all the roughage desired the data indicate that the oatmeal mill feed was not equal to wild hay. The first trial indicated that dairy cows are satisfied and contented when oatmeal mill feed is the sole roughage. Oatmeal mill feed is somewhat less valuable as a roughage than wild hay.

Oatmeal mill feed is not so palatable as a good quality of wild hay.

The Effect of Sunlight on Vitamin D of Cows’ Milk

The purpose of this experiment was to determine whether there was any difference in Vitamin D content of milk from cows kept:

1. In direct sunlight in a dry lot.
2. In direct sunlight and on pasture.
3. In absence of sunlight.

The no-sunlight cow has been raised in the absence of sunlight. Her dam was also raised from three weeks of age in the absence of direct sunlight.

The cow in the dry lot was a first-calf heifer, and had not received any green grass since freshening.

Rats were used for the trial. The first group of rats received Steenbock’s Rachitic ration 2965. The second group received the basal ration and one per cent cod liver oil. The third, fourth, and fifth groups received the basal rations and 50 cc of milk from the sources indicated above.

A marked difference in growth occurred between the milk-fed rats and the other groups.

The check lot developed symptoms characteristic of rachitis. The cod liver oil group did not develop rachitis but failed to make the gain in weight of the milk-fed groups.

All the groups of milk-fed rats made substantial gains in weight. The group receiving the milk from the cow on pasture showed the greatest gains. The rats on the milk from the dry lot cow were second; and the rats on the milk from the no-sunlight cow were third in rate of gains in weight.

No apparent symptoms of rickets showed up in any of the milk-fed groups. The bone analysis has not been completed. The blood analysis was not conclusive.

Influence of Sunlight on the Growth and Health of Dairy Heifers

Two females, descendants from the original animals, are in the herd. These are the second and third generation animals raised in the absence of direct sunlight.

The milk from the first generation cow was used in the Vitamin D experiment.

No apparent effect on the health and growth of the calves result from the exclusion of direct sunlight. The milk from the no-sunlight cow is affected but slightly if at all.
Cross Breeding Experiment (State)

Nine cows of the first cross have freshened. Three complete lactations are available for two cows, two lactations for two more.

One $F^2$ heifer has freshened and another will freshen soon.

No $F^3$ females are available in the herd as yet.

Most of the $F^3$ generation are red and white in color, and show breed characteristics of both Holsteins and Jerseys. The head resembles that of the Jersey breed. The size is an average of the two breeds.

The per cent of fat in the $F^2$ heifer which has freshened seems to be somewhat lower than in the $F$ cross. However, this may be peculiar to this one heifer only.

Home Economics
By E. Pierson

Nutrition Project

The Study of the Vitamin C Potency of Spinach Under Varying Conditions (Purnell)

The nutrition project for 1931-32 provided for the study of the Vitamin C potency of spinach under varying conditions. It provided for using both the Sherman method (90-day period) and the Hojer method (20-day period) for testing. Much effort was put forth and much time consumed in attempting to secure satisfactory results with the short period of testing (the Hojer method), but in making the section for microscopic examination we were unable to make sections in which the odontoblasts were distinguishable. Hence, diagnosis by this method was unreliable. As yet we have been unable to determine what is the cause of our difficulty. In the further report the number of pigs used in testing by the Hojer method will not be considered and the work disregarded.

Both the New Zealand spinach and the ordinary garden spinach ($Spinacia oleracea$) were used in the tests. As the outline for the project suggests, two of the factors to be studied were the effect of reheating the canned product and of letting it stand for twenty-four hours exposed to the air.

A total of 125 guinea pigs were used in the testing.

Sherman's basal ration was used the same as in previous years, except that this time we ran the butter fat through filter paper in clarifying. The pigs were weighed three times a week and the weights recorded.

In 1928 we tested commercially canned spinach, but as there is chance for variation in canned products in different seasons and especially in different brands, we repeated the test on freshly opened spinach.

Accordingly groups 48, 49 and 50 were fed on 5, 10 and 15 grams of canned spinach respectively. These pigs made better gains that the pigs previously fed on the same amounts, yet the microscopic examination indicated that all of these pigs were somewhat scorbutic. In 1928 microscopic examination was not made of the ribs of each pig; hence in some cases test animals were recorded as free from scurvy, while if diagnosis were based on microscopic determinations, they would have doubtlessly been recorded as scorbutic.

In running this test it was expected that 15 grams, at least, would provide complete protection from scurvy, but as it did not it seems that
the best method of comparison is the rate of growth and general condition of the test animals, which is indicative of the degree of protection.

Groups 51, 52 and 53 were fed 5, 10 and 15 grams respectively of canned spinach that was heated to the boiling point and held at that temperature for three minutes. It was assumed that this would be about the length of time that a housewife would heat canned spinach in preparing it for table use.

Groups 54, 55 and 56 were given 5, 10 and 15 grams respectively of spinach that had been opened and left exposed to the air for twenty-four hours.

Groups 57, 58 and 59 were given a daily dosage of 5, 10 and 15 cc of juice from a freshly opened can of spinach.

All but three of the pigs in these groups lived through the experimental period. One, on 5 grams of spinach, died at the end of the seventy-fifth day. It began to lose weight at the end of the eighth week and soon showed indications of scurvy. One, on 5 grams of spinach opened for twenty-four hours died on the eightieth day. It lost weight after the eighth week and showed decided signs of scurvy on the seventy-sixth day. One on ten grams of spinach began to lose weight during the seventh week, and died on the eightieth day. Autopsy revealed scurvy.

As this was the first work that we had done with New Zealand spinach, it seemed advisable to run a test on the fresh green product to determine something of the deterioration of Vitamin C in the canning process. The fresh spinach used could hardly be considered to have grown under normal conditions, and this may have had some effect on the potency of the product. In the first place the summer of 1931 was very hot and dry, and influenced the rate of growth. The first half of the 90-day period, the spinach was picked fresh from the garden each morning; for the next four weeks the spinach was protected from freezing by a frame artificially heated, and for the remainder of the time the spinach was grown in the greenhouse.

The canned spinach was a home grown, home canned product and was from the same garden and same planting as the fresh spinach used in the first part of the feeding period.

Of the guinea pigs fed on the freshly picked New Zealand spinach only seven animals lived through the experimental period. Of these, only one made much, if any gain, after the seventh week. Autopsy showed scurvy in all.

Of the animals given the canned New Zealand spinach all had died by the forty-eighth day. All indicated scurvy and were in a terrible condition. All but one weighed less at the end of the experimental period than at the opening of the period. As the canned New Zealand spinach did not appear to provide any protection against scurvy, it seemed useless to carry this test further.

Conclusions

The guinea pigs fed on commercially canned spinach during the year 1931-1932 made a little better average gains than those fed in 1928, indicating that the brand of spinach was equal to if not superior, to that used in the earlier experiments.

The juice of commercially canned spinach is as rich in Vitamin C as the solid portion.
The results of these tests indicated, both by growth curves and microscopic examination of the bones, that there is practically no deterioration in the Vitamin C content of commercially canned spinach, either by boiling three minutes or by leaving exposed to the air for twenty-four hours. Commercially canned spinach (Spinacia clereacea) is a fair source for Vitamin C, but fifteen grams does not provide complete protection from scurvy for a guinea pig.

As a source of Vitamin C, New Zealand spinach is unsatisfactory.

Textile Project.

The Influence of Various Grades of Wool on Some of the Physical Properties of Flannel (Purnell)

The wool was purchased from the animal husbandry department. Fleeces from yearling Shropshire, Rambouillet, Crossbred (Siberian and Rambouillet), Grade Karakul, Southdown and Hampshire were used.

The length and diameter of fibers were studied. Microphotographs were taken of typical fibers from each breed.

The yarn was studied under the following heads:
1. Count
2. Twist
3. Tensile strength and elasticity

The fabric was studied under the following subjects:
1. Thread count
2. Weight per square yard
3. Tensile strength and stretch
4. Fat removed—tensile strength
5. Abrasion—tensile strength
6. (a) Shrinkage—tensile strength
   (b) Shrinkage—abrasion and tensile strength

Conclusions: Some indications of this group of fleeces are as follows:
Rambouillet and the Crossbred average very nearly the same in crimp and fineness. The number of crimps per inch is the least in the grade Karakul while the Hampshire shows the coarsest fiber on the average. The greatest variation exists in the Karakul and grade Karakul.
In the length of fiber the Crossbred has the advantage over the Rambouillet while the Karakul and grade Karakul are much the longest of the group.
The yarn count shows the yarns to be quite near in thickness, varying less than one per pound.
The twists ranged from 4.5 to 6.7 per inch, which probably does not effect the strength materially.
The tensile strength of the yarns seems to be quite indicative of the strength of the fabrics with but few variations. Crossbred and Rambouillet are the strongest, with Southdown much the weakest. The Karakul and Shropshire show the least stretch. The others rank very nearly the same.
The number of threads per inch each way varies but little. The Hampshire has the lowest count widthwise. Perhaps this is one factor in its being the next to the lowest in most of the tests.
The weight per square yard was quite uniform. The Hampshire and Shropshire are the lightest weight while the grade Karakul is the heaviest.
The Rambouillet and Crossbred test the highest in tensile strength while the Southdown is the lowest. In abrasion, shrinkage and soxhlet, the strength tests ran about the same as simple tensile strength tests, but somewhat lower.

In the bursting test the variation was greater but in general the strength compared favorably with the tensile strength tests. One marked difference is that the Karakul showed a much greater strength in that it ranked next to the crossbred. This is probably due to the length of the fibers and to the fact that it stretches less than the other yarns.

Entomology-Zoology
By H. C. Severin

Three projects were investigated during the past year, all financed through Adams funds. Adams Project No. 5 was conducted under the leadership of George Gilbertson, while Adams Project No. 6 and No. 7 were carried on under the leadership of H. C. Severin.

The experimental work covering the cricket project, No. 4, was completed last year, but the writing of the manuscript and the preparation of the drawings to be used in illustrating the bulletin have taken more time than was expected, and consequently the manuscript could not be completed last year.

A project covering a study of the food eaten by the ring-necked pheasant was conducted by the writer. This project was financed through the State Department of Game and Fish. A manuscript discussing the results of this investigation is being prepared and will be ready for publication during the present fiscal year. The cost of printing this bulletin is to be paid for by the State Department of Game and Fish.

The Plum Tree Borer (Adams Project 5)
The Plum Tree Borer (Synanthedon pictipes G. & R.),
Its Distribution, Life History, Economic Importance and Control

The experimental work on this project will be completed during the present fiscal year and a manuscript covering the investigation will be submitted toward the close of the year. During the past year additional data on control were obtained. This dealt especially with the relative value of fluid carriers of parachlorobenzene. Several oils, acting as carriers of P. D. B., were used in these experiments and their value and ease of application were compared with melted paraffin as a carrier.

Most of the drawings and photographs to be used in illustrating the bulletin covering this project have been prepared.

The Cyrtacanthacrinae Grasshoppers (Adams Project 6)
The Grasshoppers of the Subfamily, Cyrtacanthacrinae, of South Dakota, their Economic Importance, Distribution, Life Histories, and Control

An additional 1000 specimens of grasshoppers were collected in South Dakota during the past year. The grasshoppers collected were mounted, properly labeled with locality, date and collector labels, and were then identified as to species or variety. The acquired data regarding range of each species were then recorded on our distribution maps of South Dakota. The data dealing with seasonal distribution and the food plants of each species were also recorded. Records were also taken regarding relative
abundance of each species, and notes were included regarding the economic importance for the year of each species. The grasshoppers collected are all stored in Comstock cases, each case containing a single species or variety. Through an arrangement of this sort it is possible to study any one species or variety with the greatest convenience.

While nearly all of our Cyrtacanthacrinae grasshoppers (except those living in wet or swampy environments) increased decidedly in numbers during the past few years, four species were predominant in 1931, namely, Melanoplus bivittatus (Say), Melanoplus differentialis (Thos.), Melanoplus femur-rubrum femur-rubrum (DeG.), and Melanoplus mexicanus mexicanus (Sauss.). These species of grasshoppers are listed in the order of their economic importance for 1931. However, the four species of grasshoppers listed do not all prefer the same ecological environment in which to live and reproduce. The environments preferred by each species were discussed briefly in my report for 1930, but additional information along this line was obtained during the past year.

It was again possible to study factors favoring the increase of our grasshopper population in 1932. Studies were made of the factors influencing reproduction, also factors influencing survival and destruction of the recently hatched nymphs.

Studies were also made of the principal insect enemies or our injurious grasshoppers, namely, Sarcophagid flies, blister beetles (Meloluidae) and bee flies (Bombylidae). Of these enemies the Sarcophagid flies were studied in greatest detail. Their life cycles were determined and the reproduction capacity of the flies was also studied. The influence of different types of weather upon the longevity of the flies was also investigated.

During the past year additional studies were made upon the effect of disking and dragging soils containing grasshopper eggs. The results of this investigation are discussed in bulletin 267 of the South Dakota experiment station. Studies were also made of the effect of burying grasshopper eggs at various depths. In general it may be said that the deeper the eggs are buried the less likelihood there is that the young hoppers, when they hatch, will be able to make their way to freedom. Additional studies, however, are necessary before definite statements can be made regarding the effect of plowing different types of soils for the destruction of grasshopper eggs.

The matter of migration of both nymphs and adult grasshoppers has also received some study. Some progress was made in an attempt to solve the reason for these migrations, but we are not satisfied that we know all there is to be known about this matter.

Dusting with various toxic dusts in an attempt to control grasshoppers did not give satisfactory results. Poisons used were sodium arsenite, calcium arsenate, sodium fluoride and sodium fluosilicate. These dusts were diluted with talc at the rate of one part of the poison to one, two, three and four parts of talc. A serious difficulty with all of these dusts was the tendency for them to balloon up in the air and then be carried away by the wind. Sodium arsenite and sodium fluoride had the further objection of burning vegetation to which they were applied. Experiments were also conducted with various strengths of nicotine dusts in attempts to control grasshoppers, but here again the results were unsatisfactory.

In further experiments we have been substituting sodium fluosilicate for white arsenic or sodium arsenite in our grasshopper poison baits. The modified bait has given us excellent results thus far and offers sufficient promise to warrant additional experimentation with it.
Pollinating Agents of Sweet Clover  (Adams Project 7)
A study of the Pollinating Agents of Sweet Clover in South Dakota with Special Emphasis upon Seed Production as Influenced by the Honey Bee.

Because of the emergency that existed most of our available time during the growing season of the past year was allotted to the grasshopper project. However, considerable time was available during the remainder of the year for experiment station work, and this time was largely used in identifying an additional portion of the collection of insects that was made from sweet clover flowers during the fiscal year ending June 30, 1929. However, there still remains unidentified a considerable portion of the 10,000 lot of insects that was collected in 1929.

During the past year we have found again and again that a good seed yield of sweet clover may be obtained without the aid of honey bees. However, in such cases other pollinators were present. This does not mean that it is not advisable to use honey bees to pollinate fields of sweet clover; in fact this would be advisable, not only as an additional insurance for a good seed yield, but the revenue to be derived from a good honey yield is not to be ignored.

Horticulture
By N. E. Hansen

Fruit Breeding  (Adams)

This department does not conduct a commercial nursery, but devotes special attention to the origination of new varieties that are adapted to this climate or imported from similar climates of the Old World. At this time the invoice is not completed, but including new seedlings that fruited this year, more than one million seedlings have been grown since 1895. Each plant generation yields seedlings of larger size and better quality. Hybridization and selection are the main methods of improvement. The following new fruits were distributed the spring of 1932:

Tolmo Apple.—Offered for the first time. Seedling of Tolman Sweet topgrafted on Dutchess of Oldenburg apple. Fruit good size, 2½ inches in diameter; Dutchess coloring, with white flesh, pleasant subacid; quality vary good. Season fall. The name is made from the names of the parent varieties, Tolman and Duchess of Oldenburg.

Amsib Crab.—Offered for the first time. Female parent: Wild Red, a form of Pyrus Ioensis from Iowa. Male parent: a Pyrus baccata which I brought from Moscow, Russia, in 1906. The name “Amsib” is condensed from the names American and Siberia. A good sized crab, about 1¾ inches in diameter, green and yellow, keeps all winter, with fragrant, wild crab flesh but neutral rather than bitter. It is only an ornamental tree at present, but it is the first hybrid of the indigenous American apple with the Siberian crab and has possibilities for the future.

The Indigenous American Apple

Three outstanding varieties have developed so far from my breeding work with indigenous wild crabapples.

Anoka Apple.—In this variety, the bearing habit has been changed from older wood to one-year wood. The Anoka is bearing a heavy crop in the state orchards at Sioux Falls and Brookings this year.
Redflesh Apple.—With red flowers. The fruit is red, red flesh of good quality.

Kola Crabapple.—This variety is now of great interest to the geneticists of the world. Young trees have been sent to several foreign countries. The Kola is the only known tetraploid among the cultivated named apples; it has 68 chromosomes instead of the normal diploid number of 34 chromosomes. A tetraploid makes possible the rapid production of triploids with 51 chromosomes and has long been desired by apple breeders. The fact that Kola Crabapple is a tetraploid was determined by Dr. Bernhard Nebel of the New York experiment station, Geneva, New York.

Hansen Bush Cherries

In time this may become the name finally adopted for the select type developed from the bush cherries developed through ten plant generations from 300,00 seedlings of the native sandcherry, Prunus Besseyi, a low shrub of western South Dakota. Over 300,000 seedlings are coming on and an enormous crop of fruit is ripening in the state orchard at Watertown. In late years seedlings from Manitoba have been added. The seedlings vary in size and quality of fruit, but all are good for sauce or preserves. By the time one million seedlings have been fruited, I hope to have the large good quality type bred true to seed. The white flowers and glossy leaves make it desirable as a low shrub in front of taller shrubs on the lawn. See Bulletin 224.

Progress with Hardy Roses (Hatch)

Alika Rose.—First offered spring, 1930. A brilliant red double rose, which I brought from Russia in 1906 under the name Rosa gallica grandiflora. Flowers large, fragrant, semi-double, with as high as 47 petals, with many stamens. Color brilliant red with no purple, mauve or violet red in it. It gets far away from the mauve pink of most of our wild prairie roses.

Thornless Roses (Purnell)

The experiments in the development of thornless rose stocks begin to show results. Out of many thousand seedlings, some 5000 plants with smooth wood have been selected and are being propagated as rapidly as possible. The first step in the problem is that of removing all the thorns and bristles. The main difficulty so far has been to get the midrib and stem of the leaves free from the bristles which are so annoying. Plants of this description have just been selected at the state rose garden at Sioux Falls and will be propagated as rapidly as possible.

Progress with Alfalfa (State)

Plants of Hansen Alfalfa and plants of Sibturk Alfalfa were distributed in 1932.

The Hansen Alfalfa

Flowers white and seeds white. I have decided to give this name to the Hansen Whiteseed alfalfa of which a few plants were first sent out in 1926. (See Bulletin 224.) In the spring of 1931 I offered to send ten plants free to the first 300 applicants in South Dakota. Many more than 300 applications were received, so about 3,560 plants were distributed. I am trying to perfect the Hansen alfalfa as rapidly as possible. Female
parent: the Yellow Flowered Alfalfa \textit{(Medicago alfalfa)} from Omsk, Siberia. Male parent: the Cossack alfalfa.

**The Sibturk Alfalfa**

This is a hybrid of the Siberian and the Turkestan alfalfas. The female parent is the yellow flowered alfalfa \textit{Medicago falcata}, which I brought from Semipalatinsk, Siberia in 1913. The male parent is the Select Turk estan alfalfa, remarkable for its erect vigorous growth, which I brought back from my 1906 tour. Sibturk is the name I now choose for the Hansen Hybrid No. 1, described in Bulletin 224. This is a very hardy and productive variety, showing astonishing endurance in a field where it has been cut several years to use as a lawn. The seed is held tightly in the pod. Flowers variegated in many colors, with much yellow. Sibturk is an excellent combination of these two species. The name is condensed from the words Siberia and Turkestan.

**Plant Explorations**

A large collection of plants was made in many parts of South Dakota, also in northern Minnesota, southern Manitoba, and eastern Saskatchewan. New results are best obtained by collecting new materials.

**Pharmacy**

(In Cooperation with Animal Husbandry)

By F. J. LeBlanc

A study of the properties of the oil of chenopodium obtained by cross-fertilization of chenopodium ambrosoides with a wild variety obtained from Kansas, as well as the study of the anthelmintic value of the oil obtained from this cross in the treatment of ascaris. (Purnell)

Three varieties of chenopodium were grown in 1931, namely: the Maryland variety, the seeds of which were obtained from the United States Department of Agriculture; a Kansas variety, found growing wild in that state, seeds of which were collected and planted here; and the cross between the Kansas variety and the cultivated Maryland variety. Two lots of the cross were grown, one from seed obtained in 1927 and the other from seed obtained in 1930.

Due to one of the poorest and driest growing years South Dakota has experienced for many seasons the chenopodium plants did not do well during July and August. However, with some moisture later in the season a fair growth was obtained. The yield of oil was decidedly below what it has been in normal years. The per cent of the active constituent, ascardol, was also decidedly below normal.

The plants were all distilled at a pressure ranging from 25 to 28 pounds of steam for from 20 to 30 minutes. All of the oil distilled over in this length of time. The total weight of all plants distilled was 2575 pounds and the yield of oil 900 cc.

The pigs used in this experiment were divided into four lots of eight head each. All were grade Spotted Poland China and wormy. These pigs were farrowed between April 15 and April 25. The average weight when purchased, June 30, was 23.4 pounds. The average initial weight of pigs
when placed on experiment were as follows: Lot 1, 25.8 pounds; Lot 2, 25.6 pounds; Lot 3, 25.3 pounds and Lot 4, 25 pounds.

On July 14, a sample of feces from each pig was collected and examined by the Renbrook method for ascaris eggs with the following results: 6 samples were very heavily infested, 21 samples were heavily infested and 13 samples showed considerable evidence of worms being present. Very heavily infested means several hundred worm eggs to the slide. Heavily infested means from 30 to 50 eggs on one slide. Considerable evidence of worms means less than 25 eggs per slide. However, no slide showed less than 20 eggs. This would indicate all pigs were infested with worms. However, to insure a heavy infestation ascaris were obtained from the Morrell Packing plant of Sioux Falls and ascaris eggs from these worms were fed to the pigs in their feed on July 21. Up until the time of feeding ascaris eggs the pigs were all apparently doing very well. Two weeks after feeding these eggs the pigs were not doing as well and five had died. On August 4 one of these dead pigs was posted. Eighteen large ascaris worms were found due to the primary infestation. Innumerable small worms were found in the stomach, intestines and liver, this being due to the secondary infestation caused by ascaris eggs fed. All pigs had been treated in same way and the majority of them, therefore, must have had both a primary and a secondary infestation.

Before the pigs were lotted up and wormed, five had died. After lott ing and worming pigs still continued to die, some from lots wormed and some from Lot 1 which was not wormed, so that death was not caused by worming. These pigs were all posted and information received from the station veterinarian, who did the posting, shows that the majority of pigs died from necrotic enteritis. It also shows that the pigs not wormed had a considerable number of round worms while those wormed were practically free from worms with one exception, indicating that the Oil of Chenopodium treatment was successful in the removal of the ascaris.

From the experience of past years, it would seem that the worming of the pigs at an earlier age might result in a more rapid growth at lower cost. Such a procedure will be followed with one lot during next year.

Worming, using 1½ cc. of oil of chenopodium to every 50 pounds weight is more efficient than using 1 cc. of the oil. It is our opinion that 2 cc. of oil of chenopodium per 50 pounds weight would not prove harmful.

Results show that if pigs are decidedly wormy it pays to worm them once being sure the dosage of oil is sufficient to be effective. It is doubtful if a second worming pays.

Poultry
By W. C. Tulley

The Effect of “Alkalied” Grain on Growing Chicks and Poultry. Cooperative with Department of Chemistry (Purnell)

This is a continuation of last year’s work. As a result of previous findings that eggs from affected areas were not only seriously defective in hatchability, but in addition to this the eggs which failed to hatch contained dead embryos of varying ages with malformations and deformities never previously described, it was decided to try to grow four lots of chicks to maturity and through a year of production, feeding them various levels of “alkalied” grain. The following table shows the grain part of the ra-
tions used, which have not been changed. The animal protein supplement
al part of the ration was reduced when chicks were eight weeks of age.

<table>
<thead>
<tr>
<th>Pen 1</th>
<th>Pen 2</th>
<th>Pen 3</th>
<th>Pen 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>25 normal corn</td>
<td>25 &quot;alkalied&quot; corn</td>
<td>25 &quot;alkalied&quot; corn</td>
<td>25 normal corn</td>
</tr>
<tr>
<td>25 normal barley</td>
<td>25 &quot;alkalied&quot; barley</td>
<td>25 normal barley</td>
<td>25 &quot;alkalied&quot; barley</td>
</tr>
<tr>
<td>15 normal wheat</td>
<td>15 &quot;alkalied&quot; wheat</td>
<td>15 normal wheat</td>
<td>15 normal wheat</td>
</tr>
</tbody>
</table>

As reported last year, at eight weeks of age Pen 2 averaged significa-
tly less than the check lot Pen 1, while Pens 3 and 4, did not show appreci-
able affects of only 25 per cent of "alkalied" grain, either corn or barley, probably either because of the complete nature of the rest of the ration,
or that a smaller proportion of affected grain did less harm.

The weights of surviving pullets and cockerels in Pen 2, at 32 weeks of
age are markedly less than those in the check lot as the following tabula-
tion shows:

<table>
<thead>
<tr>
<th>Pen 1</th>
<th>Pen 2</th>
<th>Pen 3</th>
<th>Pen 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nos. and wts. in grams of males at 32 weeks:</td>
<td>(3) 3203</td>
<td>(4) 2837</td>
<td>(4) 3169</td>
</tr>
<tr>
<td>Nos. and wts. in grams of females at 32 weeks:</td>
<td>(7) 2622</td>
<td>(8) 2111</td>
<td>(15) 2537</td>
</tr>
</tbody>
</table>

Weights of males are not significant due to small numbers involved, but
weights of females are at least suggestive. It will be noted that "alkalied"
pullets averaged more than a pound less at 32 weeks than those receiving
a normal ration.

Pullets in Pen 2 were almost two months later coming into production
than those in Pen 1. The following table gives the total production per
bird on a hen day basis for the first four periods from November 2, 1931
to February 21, 1932.

<table>
<thead>
<tr>
<th>Pen 1</th>
<th>Pen 2</th>
<th>Pen 3</th>
<th>Pen 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production per bird (eggs)</td>
<td>53.4</td>
<td>5.57</td>
<td>36.54</td>
</tr>
</tbody>
</table>

Hatchability tests were run on several lots of eggs from each of four
pens. Only eggs from Pen 2 showed influence of being "alkalied" and in
every setting from this pen hatchability was low and practically all of the
dead embryos exhibited deformities mentioned above. Because of the rela-
tively large number of eggs set from Pen 2, with similar results in each
case, it has been definitely shown that some undetermined factor in the
feed is responsible for these conditions. That the factor is severe is un-
questionable as anything in a feed sufficiently powerful to influence the
developing embryo in such a drastic manner must be important.

The experiment station chemistry department is cooperating in the
poultry work of this study, in addition to much of their own work on the
same subject. Studies on egg analysis are being continued as work com-
pleted shows the egg albumen to contain most if not all of the toxic factor.

Feeding Values of Wheat and Wheat By-Products
(Purnell)

As a result of two experimental periods, the first of four months, and
the second of nine months, we are justified in suggesting that with the
particular ration used, which is given below, equally satisfactory results
can be secured where 30 per cent ground hard wheat in the mash part of
the ration replaces the more usually recommended wheat by-products, in
this case, 15 per cent each of wheat bran and wheat flour middlings.

Reference to Table I will show in more detail the results of the experi-
ment. Pen 1 received 30 per cent of ground hard wheat in the mash. Pen
2, 15 per cent each of bran and middlings. Pen 4, 15 per cent of ground
wheat and wheat bran. Pen 5, 15 per cent of ground wheat and wheat middlings. The rest of the mash for all pens was as follows:

- ground yellow corn 33 per cent
- ground oats 10 per cent
- meat and bone scrap 14 per cent
- dried buttermilk 5 per cent
- alfalfa meal 5 per cent
- steamed bone meal 1 per cent
- common salt 1 per cent
- cod liver oil 1 per cent

The grain ration, fed at measured levels per day to follow as closely as possible the mash consumption, was composed of:

- whole yellow corn 45 per cent
- wheat 45 per cent
- heavy oats 10 per cent

Ordinarily the price of wheat by-products is considerably higher than the wheat from which they are made. This variation changes from time to time with the result that the prices of the by-products follow closely those of wheat. As wheat is still an important crop on many South Dakota farms, a considerable saving will be made when ground wheat can be used to replace the mill products in rations for laying hens. These results check closely with those obtained at another station recently, but until further experimental work is done such a substitution must be confined to the laying ration only, and not for a starting ration for chicks.

This experiment also shows that replacing 15 per cent of the ground wheat with either wheat bran or wheat middlings was of no particular benefit.

Fifty single comb White Leghorns from the college poultry farm were used in each of the four pens. The unusually heavy mortality was due to an outbreak, in December and January, of infectious laryngo-tracheitis. The severity of this disease was apparently the same in each pen and would not affect the comparative results from various pens as production as well as feed consumption were figured on a hen-day basis. While the average production for the nine months of the experiment was satisfactory, it probably would have been better without the set-back the birds received in these two months.

### TABLE I

<table>
<thead>
<tr>
<th>Mortality</th>
<th>Total Grain Consumption per bird h. d. b.</th>
<th>Total Mash Consumption per bird h. d. b.</th>
<th>Total Production per bird h. d. b.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen 1</td>
<td>33.17 lbs.</td>
<td>24.25 lbs.</td>
<td>143.63 eggs</td>
</tr>
<tr>
<td>Pen 2</td>
<td>34.41 lbs.</td>
<td>21.99 lbs.</td>
<td>139.00 eggs</td>
</tr>
<tr>
<td>Pen 3</td>
<td>36.85 lbs.</td>
<td>19.51 lbs.</td>
<td>139.56 eggs</td>
</tr>
<tr>
<td>Pen 4</td>
<td>38.31 lbs.</td>
<td>24.80 lbs.</td>
<td>142.32 eggs</td>
</tr>
</tbody>
</table>
EXPERIMENT STATION

“Comparative Metabolism of Several Calcareous Materials in Poultry Feeding.” Cooperative with the Agricultural Experiment Station Chemistry Department. (Hatch)

This experiment ending August 31, 1932, completes five years of work to determine accurately differences in results, as measured by production, egg size, egg shell breaking strength, and body maintenance and mortalities in birds, among several calcareous materials, more commonly spoken of as lime supplements, for laying hens. The present trial is a repetition of last year’s experiment to substantiate last year’s results. One change only was made in the lime supplements used. Commercial calcite was used in one pen to replace Menno chalkstone, the commercial production of which has been discontinued. The other three used were oyster shell, Black Hills limestone, and a dolomitic Wisconsin limestone.

Twenty-five Rhode Island red pullets from the college poultry farm were used in each pen.

For the fifth year’s work, from November 1, 1931 to June 30, 1932, an experimental period of 243 days, results were as follows:

<table>
<thead>
<tr>
<th>Pen</th>
<th>Material</th>
<th>Total Egg Production</th>
<th>Egg Production per Bird on a Hen-Day Basis</th>
<th>All Mash Ration Consumption per Bird on a Hen-Day Basis</th>
<th>Mineral Consumption on a Hen-Day Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen 1</td>
<td>Oyster Shell</td>
<td>1962</td>
<td>114</td>
<td>59.35 lbs.</td>
<td>1.44 lbs.</td>
</tr>
<tr>
<td>Pen 2</td>
<td>Black Hills Limestone</td>
<td>1857</td>
<td>119</td>
<td>56.62 lbs.</td>
<td>1.34 lbs.</td>
</tr>
<tr>
<td>Pen 3</td>
<td>Dolomitic (Wisconsin) Limestone</td>
<td>1667</td>
<td>124</td>
<td>56.08 lbs.</td>
<td>1.29 lbs.</td>
</tr>
<tr>
<td>Pen 4</td>
<td>Commercial Calcite</td>
<td>1730</td>
<td>114</td>
<td>59.04 lbs.</td>
<td>2.06 lbs.</td>
</tr>
</tbody>
</table>

When production is figured on a hen-day basis, no significant difference is to be found among any of the pens. These results are similar to those found last year. A difference of 10 or fewer eggs per bird cannot be considered a significant one. Repeating the work usually will show the error of such a conclusion. This is well illustrated in a comparison of this and last year’s results, where in one case the pen receiving Black Hills Limestone was ahead an average of three eggs per bird, and in this year’s work the pen receiving a dolomitic type of limestone was ahead of the lowest pen ten eggs per bird.

Results on the breaking strength of many samples of eggs from various pens, as well as on the weights of all eggs, are not yet complete.

Results of improvement in breeding stock used in these experiments is well illustrated by the fact that for 1930-31, over an experimental period of 252 days, the average production of all birds in the experiment was 90 eggs as compared to 118 eggs per bird for 243 days in 1931-32.

Relatively low mineral consumption as shown by the table is probably explained by the fact that ordinary meat and bone scrap as used in this experiment is high in bonemeal content, and in addition one per cent of steamed bonemeal was added to the mash.
During the past year ending June 30, 1932, two projects have been conducted in Rural Sociology. (Purnell)

The first of these projects entitled "Social Change in Brookings County" is still incomplete and is being carried over into the new fiscal year of 1932-33. It is by far the most ambitious and comprehensive research project yet attempted by the department. It attempts to ascertain the types and extent of social change that have taken place in Brookings county from the beginning of the earliest white settlement in 1867 up to 1930, together with an analysis of the causes and results of these changes. It is hoped this study will be completed and a summary of results published in next year's report.

The second project entitled "Town and Country Trade Relations in South Dakota" has been completed and is now in the process of being published as Bulletin No. 274 of the South Dakota experiment station. The following is a brief digest of the results of the study:

"Accessibility to trade centers varies with the different sections of the state. Farmers in the southeast part have access to a number of shopping centers, while west of the Missouri river some are as far as a hundred miles from a shopping center with adequate supplies to meet their needs. The southeastern corner of the State makes up 11 per cent of the land area of South Dakota, 31 per cent of the population and 32½ per cent of the towns of the State. Moreover the towns in this area average larger than in any other area.

Business enterprises in most fields have kept pace with population increases and town growth during the last thirty years. General stores and stores selling farm supplies are the exception to this rule. Rural counties have fewer retail services in the fields of luxury, foods, and clothing than urban counties, which may reflect, in part, differences in needs and desires of rural and urban groups.

Differences in large and small trade centers consist not only in the numbers of stores offering specific types of merchandise but also in a greater range of specialized retail stores, and a greater selection in each respective field. Clothing and department stores are the exclusive possession of the larger trade centers, while the smaller center approaches a monopoly on the general store.

There is a population limit below which a specific type of store cannot operate successfully. The general store needs not even be in an urban center, but the clothing store seldom succeeds in a town of less than 750 population; the drug store in a town of less than 375 people; and the department store in a town of less than 1000 people.

When a South Dakota town has passed 7500 in population, it has almost without exception pushed beyond the 10,000 point rapidly. Lead, a mining town, is the only exception.

Food units have a greater proportionate distribution in large population centers than other mercantile enterprises. Transportation units are high in all towns, indicating a mobile society. Stores dispensing farm supplies are more numerous in ratio to other units in towns under 2500 in population.
Chain stores have existed since 1900, but at that time were primarily in lumber and elevator businesses. Now they are entering the grocery, variety, and department stores, and banking fields.

Merchandising is an index of social change reflecting changes in attitudes, tastes, habits, economic organization, and technology.

Retail stores have declined since 1926 to a number lower than for either 1921 or 1926. The number of towns in the State have not increased since 1926.

The thirty-year period covered in this study has seen towns appear and disappear in great numbers. However, during the last ten years this process has been greatly modified, indicating that radical social and economic reorganization induced by the automobile, railroad, rural route, etc., is coming to a close.

More than twice as many trade centers have appeared during the thirty years as have disappeared; 286 have disappeared while 643 have appeared."

Veterinary
By C. C. Lipp

Hemorrhagic Septicemia Project No. 1 (Adams)

During the year closing June 30, 1932 a large number of tests of hemorrhagic septicemia germs was made to determine whether or not these germs produce exo or endo toxins. This work had not been done in any other laboratory with these germs as nearly as we could determine. The technique consisted in growing the organisms in the incubator for a sufficient length of time, and then subjecting them to a severe shaking in a shaking machine in order to break up the germs and liberate the toxins. The material thus shaken was filtered to free it from germs tested for sterility and injected into suitable laboratory animals. We find that under certain conditions toxins are produced that are apparently liberated by the germs, and under other conditions toxins are only liberated when the germs are disintegrated. This information sheds light on the development of the disease as it is encountered in the field. Doctor J. B. Taylor who is paid from Adams’ Fund performed this work.

Doctor J. B. Taylor, a member of the staff of the veterinary department was official pathologist for the following projects and performed the work that was brought him from time to time. Since the veterinary department is not in charge of any of these projects, the full and complete report of each project will be submitted by the departments for these projects in charge.

Projects as noted:
Pharmacy, Project No. 1
Home Economics, Project No. 7
Animal Husbandry, Project No. 1
Poultry Husbandry, Project No. 4
Chemistry, Project No. 1
Poultry Husbandry, Project No. 5
Dairy Husbandry, Project No. 1
FINANCIAL REPORT
By R. A. Larson, Secretary

Receipts

<table>
<thead>
<tr>
<th>Hatch</th>
<th>Adams</th>
<th>Purnell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received from the Treasurer of the United States</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
</tr>
</tbody>
</table>

Disbursements

<table>
<thead>
<tr>
<th>Hatch</th>
<th>Adams</th>
<th>Purnell</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Salaries</td>
<td>$7,681.62</td>
<td>$7,478.24</td>
</tr>
<tr>
<td>Labor</td>
<td>3,531.30</td>
<td>4,680.94</td>
</tr>
<tr>
<td>Stationery and Office Supplies</td>
<td>169.32</td>
<td>23.50</td>
</tr>
<tr>
<td>Feeding Stuffs</td>
<td>265.55</td>
<td>107.80</td>
</tr>
<tr>
<td>Scientific Supplies, Consumable</td>
<td>57.70</td>
<td>180.29</td>
</tr>
<tr>
<td>Sundry Supplies</td>
<td>323.63</td>
<td>323.26</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>.40</td>
<td>37.26</td>
</tr>
<tr>
<td>Communication Service</td>
<td>12.35</td>
<td></td>
</tr>
<tr>
<td>Traveling Expenses</td>
<td>187.69</td>
<td>892.35</td>
</tr>
<tr>
<td>Transportation of things</td>
<td>136.57</td>
<td>74.43</td>
</tr>
<tr>
<td>Publication</td>
<td>2,326.06</td>
<td></td>
</tr>
<tr>
<td>Heat, Light, Water, and Power</td>
<td>20.71</td>
<td>45.22</td>
</tr>
<tr>
<td>Furniture, furnishings, fixtures</td>
<td>24.50</td>
<td>84.49</td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td>27.87</td>
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<td>Scientific Equipment</td>
<td></td>
<td>534.88</td>
</tr>
<tr>
<td>Livestock</td>
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<td></td>
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<tr>
<td>Tools, Machinery, and Appliances</td>
<td>191.49</td>
<td>543.00</td>
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<tr>
<td>Buildings and Land</td>
<td>121.74</td>
<td>11.69</td>
</tr>
<tr>
<td>Contingent Expenses</td>
<td></td>
<td>2.17</td>
</tr>
</tbody>
</table>

TOTAL $15,000.00 $15,000.00 $60,000.00

EXPERIMENT SUB STATION

Balance on hand July 1, 1932 $ 5,883.22
Receipts from Land Rentals | 3,684.68 |
Receipts from Sales of Produce, Cottonwood Sub-Station | 65.00 |
Receipts from Sales of Produce, Eureka Sub-Station | 88.65 |
Receipts from Sales of Produce, Highmore Sub-Station | 51.70 |
Receipts from Sales of Produce, Vivian Sub-Station | 437.33 |
Receipts from Sales of Produce, Newell Sub-Station | 3,156.59 |

TOTAL $13,337.17

Expended

<table>
<thead>
<tr>
<th>Hatch</th>
<th>Adams</th>
<th>Purnell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$20.62</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>2,083.94</td>
<td></td>
</tr>
<tr>
<td>Stationery and Office Supplies</td>
<td>45.91</td>
<td></td>
</tr>
<tr>
<td>Scientific Supplies</td>
<td>5.77</td>
<td></td>
</tr>
<tr>
<td>Feeding Stuffs</td>
<td>2,196.98</td>
<td></td>
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<tr>
<td>Sundry Supplies</td>
<td>441.38</td>
<td></td>
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<tr>
<td>Fertilizers</td>
<td>73.74</td>
<td></td>
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<tr>
<td>Communication</td>
<td>54.50</td>
<td></td>
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<td>Traveling Expenses</td>
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<tr>
<td>Transportation of things</td>
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</tr>
<tr>
<td>Heat, Light, Water, and Power</td>
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<td></td>
</tr>
<tr>
<td>Furniture and Fixtures</td>
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<tr>
<td>Livestock</td>
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<td></td>
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<tr>
<td>Tools, Machinery and Appliances</td>
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<td>Buildings and Land</td>
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<tr>
<td>Contingent Expenses</td>
<td>.35</td>
<td></td>
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TOTAL $7,812.48 $7,812.48
Balance on hand June 30, 1932 $5,524.69

TOTAL $13,337.17
### SALES FUND (BROOKINGS STATION)

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
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<tr>
<td>Balance on hand</td>
<td>$3,163.59</td>
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<tr>
<td>July 1, 1932</td>
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<tr>
<td>Receipts Sales</td>
<td>2,352.74</td>
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<td><strong>TOTAL</strong></td>
<td><strong>$5,516.33</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
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<tr>
<td>Labor</td>
<td>1,443.94</td>
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<td>Stationery and Office Supplies</td>
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<td>Transportation of things</td>
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<td>Heat, Light, Water, and Power</td>
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<td>Furniture, Furnishings and Fixtures</td>
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<td>Tools, Machinery and Appliances</td>
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<td>Communication</td>
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<td>June 30, 1932</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$5,516.33</strong></td>
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</tbody>
</table>

### HORTICULTURE AND LIVESTOCK EXPERIMENT FUND

| Appropriation | $15,000.00 |

<table>
<thead>
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<th>Amount</th>
</tr>
</thead>
<tbody>
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<td>$6,838.22</td>
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<td>2,513.12</td>
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<td>Livestock</td>
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### POTATO EXPERIMENT FUND

| Appropriation | $841.10 |

<table>
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</thead>
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<td>Sundry Supplies</td>
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<tr>
<td>Transportation of things</td>
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<tr>
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<td>61.60</td>
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<td>Communication Service</td>
<td>67.94</td>
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<td><strong>TOTAL</strong></td>
<td><strong>$841.10</strong></td>
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</tbody>
</table>

### POPULAR BULLETIN FUND

| Appropriation | $1,261.65 |

| Publications | Expended | $1,261.65 |
## SUB STATION FUNDS

<table>
<thead>
<tr>
<th></th>
<th>Cottonwood</th>
<th>Eureka</th>
<th>Highmore</th>
<th>Vivian</th>
<th>Newell</th>
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<tbody>
<tr>
<td>Appropriation</td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,000.00</td>
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<tr>
<td>Salaries</td>
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<td>2,697.04</td>
<td>2,701.66</td>
<td>2,380.00</td>
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<td>Labor</td>
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<td>20.85</td>
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<td>Feeding Stuffs</td>
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<td>Office Supplies</td>
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<td>13.92</td>
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<td>Sundry Supplies</td>
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<td>178.31</td>
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<tr>
<td>Tools and Machinery</td>
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<tr>
<td>Transportation of things</td>
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<tr>
<td>Communication</td>
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<td>3.00</td>
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<td>Livestock</td>
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<td>33.33</td>
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<td>Heat, Light, Etc.</td>
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<td>11.57</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,716.75</td>
<td>2,000.00</td>
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</tbody>
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