Summer 1950

South Dakota Farm and Home Research

Agricultural Experiment Station

SOUTH DAKOTA

J. W. McCarty

FARM and HOME Research

Vol. 1, No. 4 Summer 1950

Dear Folks:

One of the outstanding meetings of the year was the tenth annual Livestock Feeders' Day held recently at State College and sponsored by the Animal Husbandry department. Attendance from out over the state greatly exceeded that of any previous Feeders' Day. The program brought out the results of the livestock research work conducted during the year, and from the questions asked it was evident that a greater interest is being taken in the state in livestock production, feeding and marketing.

Farmers in the central part of the state will be interested in two Field Days to be held in July. The first will be held on Saturday, July 8th, at the Central substation at Highmore, and the second on Tuesday, July 11th, at the North Central substation at Eureka. The programs will start at 1:30 p.m. There will be a preview of crops and grasses, shelterbelt and orchard plantings, and farmstead improvements. Feed reserves of hay and silage have been maintained through the years, and their nutritive value under storage will be presented. Research on the wintering of beef cattle and the poultry research will also be discussed.

This issue completes the first volume of *Farm and Home Research*. We trust that you have found it of value. The research activities to be reported upon in next year's issues will be different than those reported upon this year, and we hope they will be fully as useful to the farmers and homemakers of the state.

Cordially,

I. B. Johnson

Director

SOUTH DAKOTA
FARM and HOME
Research

A REPORT OF PROGRESS

Vol. I SUMMER, 1950 No. 4

In This Issue

Our Cover

Those brilliantly lighted farm buildings pictured on the cover are on the Wilmer Davis's 160-acre farm, about 3 miles north of Brookings. The Davis's and their children—two girls and a boy—moved out there about three years ago. The farmhouse has automatic oil heat, a bath, and an electric hot water heater, to give them many of the comforts farmers dream about.

Mr. Davis is manager of Sokota Hybrid Producers, which uses all of the State College Experiment Station inbred lines of seed corn, though they are not connected with the Experiment Station. Under the circumstances, it is not surprising that Mr. Davis, himself, raises hybrid seed corn, and some flax on his farm.

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These instruments and pellets, though small, produce big results in daily gains of lambs.

Implanting a stilbestrol pellet in lamb's neck.

Stilbestrol

Boosts Lamb Gains 20%

By R. M. Jordan

It doesn't require a miracle to increase the daily gains made by feeder lambs by about 20 percent and lower the feed required to put that gain on by an equal amount. About two cents worth of chemical will do the job, a chemical which reacts in the body much like the female sex hormones and is called stilbestrol (pronounced still-*bess*-trol). This is the same chemical that poultrymen have been tenderizing roosters with during the last few years. Cattlemen also have increased the daily gains as much as a third of a pound a day with this same chemical.

The administration of the pellet is fast and simple. This chemical, with hormone-like properties, comes in little pellets about half the size of a kernel of wheat, and is deposited under the skin of the animal in the region of the neck. After the pellet has been deposited, there is no further treatment required, though, of course, a good well-balanced ration is required in any successful feeding operation.

First Trial Conducted on Suckling Lambs

To substantiate early findings and cast further light on the subject, a series of trials were conducted at the South Dakota State College Experi-

ment Station during 1949-50. The first trial was conducted with young suckling lambs of about one to two months of age. Twelve pairs of twin lambs of which both lambs in the pair were of the same sex were used in order to minimize genetic variation between the lambs. One lamb of each set of twins received a 12-milligram pellet of stilbestrol implanted just under the skin. All of the lambs in the experiment received grain and hay in a creep, plus their mother's milk. The ewes were fed alfalfa hay, free choice, plus about one pound of grain per head daily until about May 15, at which time the ewes and lambs were turned onto grass and no grain was fed either the lambs or ewes after that period.

Capacity of Suckling Lambs to Grow Cannot Be Accelerated

The effect of stilbestrol treatment on the rate of gain in suckling lambs is summarized in Table 1. Results indicate that treating suckling lambs with 12 milligrams of stilbestrol did not increase the rate of gain. On the other hand, the treatment did not cause any dwarfing, as normal growth was made in all treated lambs. In addition, the hormone did not cause a cessation of the reproductive ability, as both ewe lambs and ram lambs proved to be fertile in later tests. Further experiments will be conducted to obtain additional information on this subject, but at this time the work of this station indicates there is no object in planting stilbestrol pellets in young suckling lambs, as apparently inherit capacity to grow is at a maximum and cannot be accelerated with the implantation of 12 milligrams of stilbestrol.

Table 1. Effect of Stilbestrol on Rate of Gain of Suckling Lambs

	12 Milligram Stilbestrol	Controls
Number of lambs	12	12
Days on feed	90–105	90–105
Initial weight	24.0	25.0
Final weight	72.8	74.7
Total gain per lamb	48.4	48.8
Average daily gain	.469	.478

Fattening Lambs Four Months of Age Treated

Two other trials were conducted to determine the effect of stilbestrol on fattening lambs. In the first trial the lambs treated were about four months of age. Four lots of 13 lambs each were full-fed from August 22 to November 5, a period of 74 days. These lambs received a full feed of corn, soybean oil meal (10 percent by weight), and brome hay. They had access to fresh water and salt. No attempt was made to equalize the feed intake as it was felt that it was quite important to determine whether the treatment of stilbestrol would increase the feed intake per day. Each lamb in two of the four lots was treated with a 12-milligram pellet of stilbestrol, implanted just under the skin below the ear. The other two lots were not treated and served as the check lots.

Treated Lambs Gain 20 Percent More

The effect of stilbestrol on fattening lambs is given in Table 2. In the first trial the results of the treated lambs from Lots I and III were averaged together in one group for ease of presentation, making a total of 26 lambs, and Lots II and IV were grouped together making a total of 26 lambs in the control group. The treated lambs gained .43 pound a day over a 74-day period, whereas the control lambs gained .35 pound per day for the same period. As shown in Table 2, there was very little

difference in their daily feed consumption, and the carcass grades of treated lambs were equal to the control lambs. As might be expected, the lambs that gained the fastest also were the most efficient in their feed utilization, inasmuch as the lambs in Group I required only 362 pounds of corn per hundred pounds of gain and the control lambs required 411 pounds.

7-Month Feeder Lambs Used

To get further information, a second trial was conducted using feeder lambs that were about seven months of age. These lambs were divided into two groups of 25 lambs each and were fed for a period of 92 days. They were sheared before being placed on the experiment and received a full feed of corn, soybean oil meal, and brome hay in a manner similar to that in the first trial. Twenty-five of the lambs had a 12-milligram pellet of stilbestrol implanted under the skin. The results of this experiment are also given in Table 2.

The treated lambs gained .37 pound per head daily, and the control lambs gained .29 pound per head daily. It is the opinion of this station that the slower daily gains made in the second trial, irrespective of treatment, were due to the fact that the lambs were poorer quality to start with. As with the first group of feeder lambs, the daily gains were significantly greater for those lambs that were treated.

Table 2. Effect of Stilbestrol on Growth Rate, Feed Consumption, Feed Efficiency, and Carcass Grade of Lambs

	Trial I (Feeding Period 74 days)		Trial II (Feeding Period 92 Days)	
	I Treated Av. Lots I & III	II Controls Av. Lots II & IV	I Treated	II Controls
Number Lambs	26	26	25	25
Growth Rate (lbs.)				
Average initial weight	62.1	63.5	69.1	69.2
Average final weight	93.9	89.7	103.1	95.7
Gain per lamb	31.8	26.2	34.0	26.5
Daily gain per lamb	0.430*	0.354	0.370†	0.289
Average Daily Feed Consumption (lbs.)				
Shelled corn	1.56	1.46	1.90	1.85
Soybean Oil Meal	.15	.14	.19	.19
Brome Hay	1.17	1.20	1.39	1.40
Total	2.88	2.80	3.48	3.44
Feed per 100 pounds of gain (lbs.)				
Shelled corn	362	411	501	626
Brome hay	272	339	371	480
Soybean oil meal	36.2	41.1	50.2	62.6
Total	670.2	791.1	922.2	1168.6
Carcass Grade‡				
Carcass grade in number				
U. S. Choice	9	9	1	3
U. S. Good	5	5	6	19
U. S. Commercial			12	3
U. S. Utility			6	

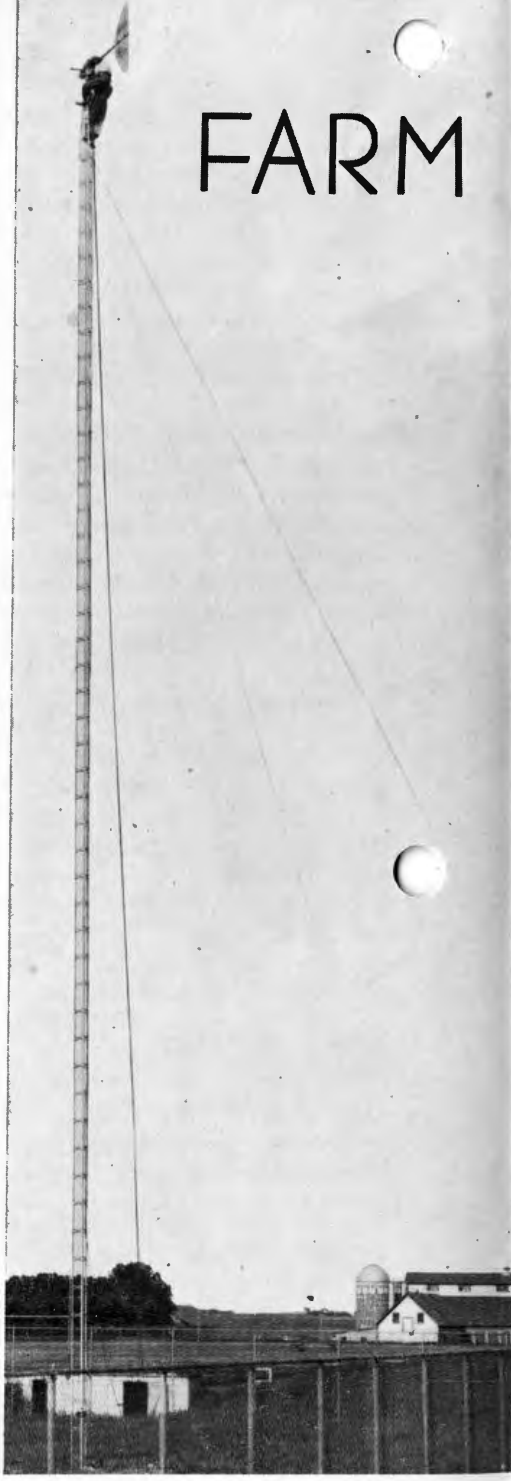
*Difference was significant (P 0.05) over controls
†Difference was highly significant (P 0.01) over control group.
‡Ewe lambs in the first trial were not sold.

About 15 Percent Less Feed Required for Treated Lambs

Again the feed consumed per head daily was not affected by the treatment. The feed required per hundred pounds of gain was about 15 percent less for the treated lambs than that required for the control lambs. However, in this trial in which lambs of about seven months of age were treated, the effect of stilbestrol on the carcass quality was quite marked, inasmuch as the lambs that were not treated graded on the average about one grade higher than those that were treated. It would appear from these two trials that the best results can be obtained from treating lambs that are four to six months of age.

Lambs treated when they are older will make greater gains than untreated lambs, but their carcass quality may be lower. In spite of that shortcoming, an increase of about 20 percent in daily gains, accompanied by a decrease of 15 to 20 percent of feed required per hundred pounds of gain, cannot be treated lightly or overlooked if one is to make maximum profits from the lamb feeding venture. Whether breed differences, such as slow-maturing Rambouillet lambs as compared to early-maturing Hampshire or Suffolk lambs, would have a significant effect on the carcass quality is not known at this time.

At the present time, the Pure Food and Drug Administration does not sanction the use of stilbestrol for large farm animals. It is studying means of determining stilbestrol content in the tissue of meat as the basis for possible approval of the use of stilbestrol in the not too distant future. (Project 199, Animal Husbandry Department.)



ELECTRIFICATION

By H. H. DeLong

MANY FARMS await modern facilities and the coming of electric light and power. Eventually they may have central service, but some may be in territory so thinly populated as to make such service very expensive. Others have possibilities of using gasoline-electric plants or other types of electrical plants a few years while they wait for highline service. Others may wish to know the cost of maintaining a standby plant, even after they have highline service, to give added security against line damage from storms.

Electric service provided by a central station is conceded best for thickly settled areas. No doubt, however, there is an economic limit to how many miles of line can be run to serve one farm.

Two Types of Plants Selected for Comparison

Two types of farm electric plants were selected for study from the many kinds and sizes available (Table 1), and their cost of operation compared to the cost of electric power from a central station service.

The plants selected for the research on "cost of operation" were those which could match as nearly as possible the voltage and current of central service, and those which would be automatic in their operation. An automatic gasoline-electric plant producing 110-volt, AC, 60-cycle current was one selection. Both a 1500-watt plant and a 3000-watt plant were used. These plants started automatically as soon as any load was turned on. Any of the common appliances used on highline service could be used, but the smaller plant would not start when several large appliances came on at once.

The other plant tested was a wind-electric 110-volt, DC with battery set of 180-ampere-hour rating. At the Brookings' test location it was mounted on a 105-foot guyed steel tower. The following year, when placed on the substation farm at Cottonwood, it was mounted on a 65-foot tower. The wind-electric plant was automatically controlled from a panel near the batteries, and the plant was turned on at all times. The propeller turned the generator at any time the wind was sufficient. A governor prevented excess speeds in high wind, and the automatic controls regulated the charging rate to fit the needs of the battery.

Lights, heating elements, universal AC-DC motors commonly used on the highline were used on this plant. The larger electric motors had to be shunt wound DC motors. The refrigerator used as a test load had to be of the open motor type with belted compressor.

The plant performed without mishap, except for a broken insulator due to a defective part, and it was able to ride out all high winds of the period without damage.

Test Procedures Set-Up for the Automatic Engine Plants

The gasoline-electric light plants were of the two-cylinder, air-cooled design, with direct, connected generator. They were mounted on a concrete base, but had rubber shock ab-

sorber mounting bushings. The room was dry and well-ventilated, although winter temperatures did get down to below freezing.

Each plant had its automatic control box mounted above it on a panel. The output current went to a watt-meter, and thence to the outlet panel. One outlet for each plant was hand switched for testing purposes. Each plant had an outlet to which machines with their own automatic switch could be attached. In addition, each plant had several outlets controlled by relay switches operated by a master rotoswitch.

Plants Carry Typical Farm Load

The roto-switch turned once in every 24 hours, and it could be set up so as to turn on loads at various times of the day. For most of the test period the plants were run on a loading pattern that resembled typical farm power and light load. That is, lights were turned on for a short time in the morning and from 5 p.m. in the evening. Figure 1 shows the pattern of the daily loads for the plants. Each was loaded with three appliances: lights, a heating appliance and a motor.

Special tests were run with gasoline-electric plants to test their dependability and ability to handle loads. A refrigerator was added to the 3000-watt plant load for one month. The plant handled this additional load above its average of 6 kwh per day and fuel costs increased sharply due to the much more frequent starting and stopping of the plant. Daily consumption increased from 6 to 8 kwh and daily fuel consumption from 2½ to 5 gallons.

Records Kept on Fuel Consumption

Records were kept on fuel consumption, kwh of current generated and labor for care and servicing. These costs when added to depreciation and interest represented the total cost of the plant. Total cost for a period divided by the kwh generated for that period gave the unit cost for the electricity. The fuel consumption curves for the 3000-watt plant at various loads are given in Fig. 2. The large plant was slightly more economical and, in addition, could start under

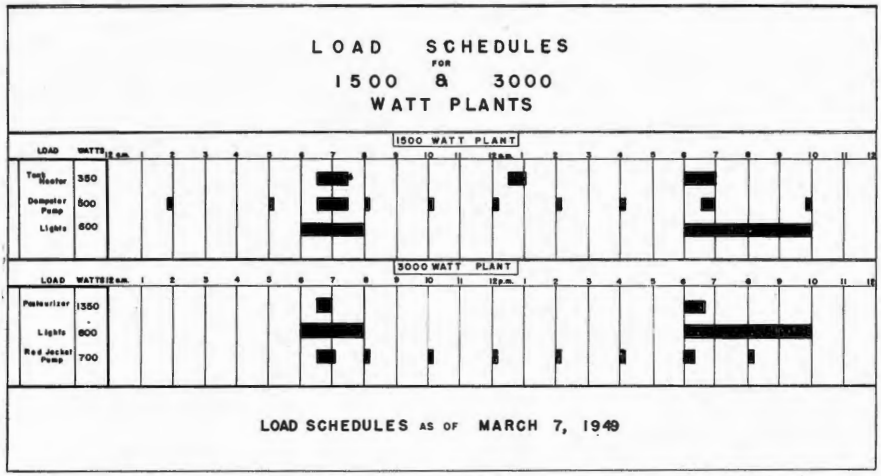


Fig. 1. Time chart showing the "on" periods during the day for the gasoline-electric plants.

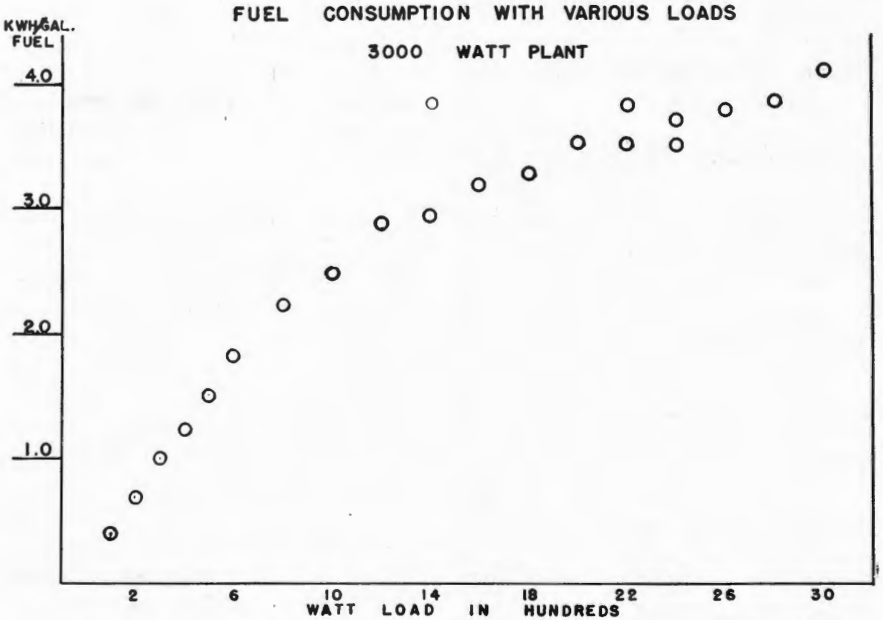


Fig. 2. Maximum loading of the 3000-watt plant gave the highest kw-hours per gallon of fuel.

Table 1. Initial Costs of Various Farm Electric Light Plants

Plant Size and Description	Approximate First Cost
350-watt gasoline-electric, 32-V DC, manual control	$400 $500
1000-watt gasoline-electric, 32-V DC	400 525
1000-watt gasoline-electric, 32-V DC, complete with battery set	540 600
2000-watt gasoline-electric, 32-V DC, complete with battery set	650 700
350-watt gasoline-electric, 110-V 60c, AC, manual controls	$175 $225
750-watt gasoline-electric, 110-V 60c, AC, manual controls	200 250
1000-watt gasoline-electric, 110-V 60c, AC, manual controls	250 300
1500-watt gasoline-electric, 110-V, 60c, AC, automatic controls	400 550
3000-watt gasoline-electric, 110-V 60c, AC, automatic controls	475 575
12-V small size wind-electric, 20′ tower, automobile-type battery set	$160 $200
32-V small size wind-electric plant, guyed tower 60′ high, 180 ampere hour battery set	700 800
32-V large size wind-electric, guyed tower 60′ high, 400 ampere hour battery set	1400 1600
110-V large size wind-electric, guyed tower 60′ high, 180 ampere hour battery set	1700 1900

Table 2. Operating Costs for 3000-Watt Powerlite Plant with Various Daily Consumption

Totals				Costs per Kilowatt Hour							
Daily Consumption KWH	KWH Generated	Hours Run	Cost of Fuel Consumed	Fuel Consumed	Labor for Refueling	Oil	Repairs	Service and Repair Labor	Depreciation	Interest on Investment	Total Cost
4	48	84	$ 6.43	$0.13396	$0.0125	$0.0245	$0.0044	$0.0188	$0.1312	$0.0206	$0.3478*
5	110	154	13.49	.12264	.0099	.0158	.0035	.0150	.1050	.0164	.2883
6	210	245	21.38	.10181	.0083	.0163	.0029	.0125	.0875	.0137	.2431
7	56	56	5.19	.09264	.0071	.0139	.0025	.0107	.0750	.0117	.2137
8	24	21	2.08	.0867	.0062	.0121	.0022	.0094	.0656	.0103	.1924
Operating costs for all loads during entire period Jan. 8—May 26											
	840	957		.10844	.0083	.0138	.0018	.0071	.0833	.0138	.2366

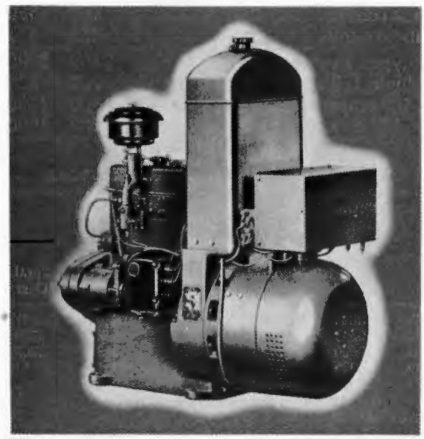
Note: Daily running time assumed constant at 7 hours.

heavier loads. The total costs per kwh are shown in Table 2, with individual cost items and the totals under various loading conditions.

Only Minor Repairs Needed

One operator had full charge of both light plants and a careful record was kept of all time spent with the plants. At times daily refueling was necessary, because the original fuel tanks of 5-gallon capacity were used. This need not be the size of tank used on regular farm installations. Oil was changed according to manufacturer's instructions.

At the manufacturer's specified times, the engine heads were removed and carbon deposits removed from piston and cylinder head. Only minor repairs were needed, such as an oil leak on the small plants, one fuel pump replacement, governor resetting to keep the plants on 60 cycles per second, and slight trouble with the breaker point assembly. Only one minor replacement was necessary in the automatic control cabinet, that of an electrical relay.



A typical gasoline-electric farm light plant.

Although not needed on the test plants during the test period, a periodic overhaul is advisable in the life of any frequently-run gasoline engine. Cost of an overhaul was included in total cost estimates.

Valuable Features Offset High Cost

While cost of electricity for the gasoline-electric plants is high, 2½ cents per kwh, plants of this type have several valuable features. First, the plant can produce electric service for the isolated farm or ranch. Secondly, it can hurry the process of farm electrification while the farm owner waits for a proposed line to be built into his territory. (The same appliances can be used.) Thirdly, the automatic plant can be used for standby service by the REA consumer in case of outages due to storm damage of lines.

Records for more than two years show the cost of electricity generated by a 110-volt, DC, wind-electric plant to be from 9 to 10 cents per kwh. A plant similar in capacity, but with 32-volt battery set will generate current for 7 or 8 cents per day. This is for an average daily consumption of 5.55 kwh.

Retail rates of most of the rural electric cooperatives in South Dakota average 3¼ to 3¾ cents per kwh, line density of one farm per mile to 2½ farms per mile, and average consumption per farm of about 150 kwh per month.

Calculations show, however, that current costs would have to go up as line costs increased, so that in territory where there were three or more miles to one consumer, the cost would become greater than for some of the alternate methods. (Project 188, Agricultural Engineering Department.)

By E. Feder

egg marketing losses

How do egg marketing practices in South Dakota compare with those in other states? Are eggs marketed in South Dakota equal or inferior in quality to eggs marketed elsewhere in the Midwest?

The answer to these questions is of interest to South Dakota consumers and to the industry in appraising their competitive position in the large central markets of the middlewest and the east. To some extent, the answer may be found in a survey which was conducted on a cooperative basis by experiment stations of 13 north central states. This survey attempted to ascertain the quality of eggs sold by the farmers to the first buyer and to analyze the loss in quality that occurred as these eggs moved from the country buying stations to larger assembling plants. In addition, various methods of marketing eggs by egg buyers and central assembling plants were studied and their influence on the quality of eggs analyzed.[1]

[1]Spec. Bul. 361 of Michigan State College.

Characteristics of the Country Buyers

In South Dakota, 23 country stations were studied. The volume of eggs handled by the various types of stations was small, as Table 1 suggests, ranging from 250 cases per year for the smallest, to 30,300 cases for the largest buyer. For most of the stations, egg sales did not form an important part of the total business. Fifteen out of 21 stations reported that between 90 to 100 percent of all eggs were delivered by farmers at the stations.

Eggs were delivered mainly on Wednesdays and Saturdays, almost one-third of the eggs coming in during the weekend. A large proportion

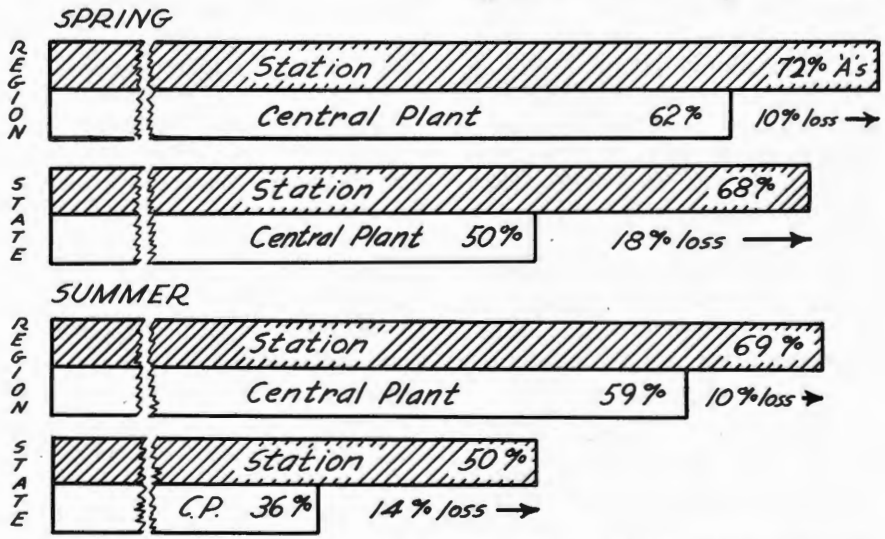


Fig. 1. Percent of "A" eggs (including stains and dirties) at the station and central plant, spring and summer, for South Dakota and the region, showing how many "A" eggs were lost between gradings.

Table 1. Volume of Business of 22 Country Egg Buyers* by Type of Business (1947)

Type of Business	Number	Total Eggs Purchased (cases of 30 doz.)	Average
Retail grocery	4	1950	487
Cream station	3	3000	1000
Produce station	7	68056	9723
Hatchery	1	600	600
Independent creamery	3	6080	2027
Cooperative creamery	4	46778	11695
Total	22	126464	5749

*One produce station did not report the number of cases purchased.

Table 2. Candling Practices of Egg Buyers, by Method of Purchase from Farmers

Method of Purchase from Farmers	Number of Stations Candling All Eggs	Number of Stations Not Candling All Eggs
Purchasing all or some eggs on graded basis	3	1*
Purchasing all eggs on loss-off method	6	7
Purchasing all eggs on current receipt basis	4	2

*This station reported grading some eggs, but also reported no candling.

Table 3. Percent of "A" Eggs* on Delivery by Farmers (Producer Lots) and One Day After (Other Receipts), South Dakota and North Central Region Compared

Type of eggs	Spring		Summer		Fall		Average	
	S. D.	Region	S. D.	Region	S. D.	Region	S. D.	Region
Producer lots	55.3	65.4	53.5	64.2	59.6	71.6	55.4	66.7
Other receipts		60.4	25.6	53.0	62.2	71.2	33.9	60.2

*Not including stains and dirties of A quality.

of the stations reported weekly door delivery, and no station reported that farmers brought their eggs more than twice weekly at any time of the year.

Of 23 stations, only one station reported that it bought *all* its eggs from farmers on a grade basis, although three purchased *part* of their eggs on a grade basis. Nineteen stations handled all eggs ungraded (current receipt or "loss-off").

As becomes apparent from Table 2, not enough buyers candled their eggs, since only 13 stations reported candling all eggs all year round and one station reported no candling at all.

Only eight stations held all or part of their eggs in a refrigerated cooler. On the day of the survey, 15 stations were holding their eggs at a temperature ranging from 65-70°.

Quality of Eggs Marketed by Farmers and by Stations

In order to determine the quality of eggs, a total of 456 lots of 100 eggs each, selected at random out of farmers' shipments, were graded on federal standards and the amount of "A" eggs determined. Three hundred sixty-three lots were graded on the day they were received and therefore show how many "A" eggs out of a 100 a farmer sells ("producer eggs"). Ninety three lots were graded the day after delivery by farmers ("other receipts").

Results for the various seasons, for eggs graded on day of receipt and those graded one day after are shown in Table 3. In summer, farmers delivered only 53 percent "A" eggs; in fall the proportion of "A" eggs was still

only 60 percent. On the average only 55 out of a 100 eggs sold by farmers were clean "A" eggs.

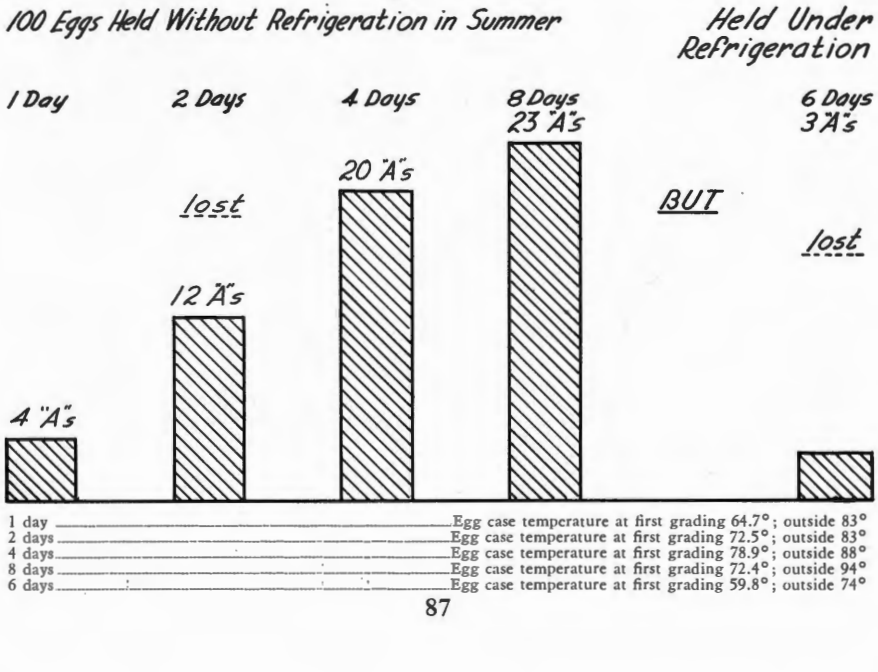
Holding eggs for one day at the station strongly affected the quality of eggs since, on the average, only 34 per cent of the "other receipts" were "A" eggs.

Poor Holding Conditions at Buying Stations

Poor holding conditions such as lack of temperature control, and number of days eggs were held between receipt and shipment adversely affect the quality of eggs. One hundred thirty four lots were graded in spring and summer, first at the station and then at the central plant ("paired gradings"). Fig. 1 shows how many "A" eggs were lost between gradings in South Dakota and in the region as a whole. It indicates that South Dakota has a long way to go before its egg marketing practices will approach those of the states farther east.

It is well known that the loss in quality of eggs increases with the days they are held. In the survey, eggs were not held under identical conditions and therefore the results shown in Fig. 2 referring to loss of "A" eggs according to number of days held at the station, are not strictly comparable. They demonstrate, however, how the length of time eggs are held and the temperature in the holding room, or outside, contribute to quality deterioration. This is first class evidence that where marketing practices are poor, financial losses to farmers and handlers are inevitable and the consumer is getting a poor quality product. (Project 175. Leaders: E. Feder, Agricultural Economics Department, Wm. Kohlmeyer, Poultry Department.)

Fig. 2. Samples of 100 eggs held with and without refrigeration in the summer, showing loss of "A" eggs.



HARVESTING PRAIRIE HAY for *Greater*

By G. E. Staples

Our prairie grasses can be harvested as hay anytime from late June up until the time winter weather prevents haying operations. The patient nature of this valuable crop in awaiting the harvest, together with the pressing work of the summer, causes many stockmen to lose sight of the fact that there is a "best" time to harvest prairie hay. Losses in valuable nutrients from prairie hay when the opportune time for harvest is past are not so evident to the eye as with such crops as our small grains. However, even though the grasses may change comparatively little in outward appearance from July to October, changes are taking place in the chemical composition of the grasses which exert great influence on their feeding value.

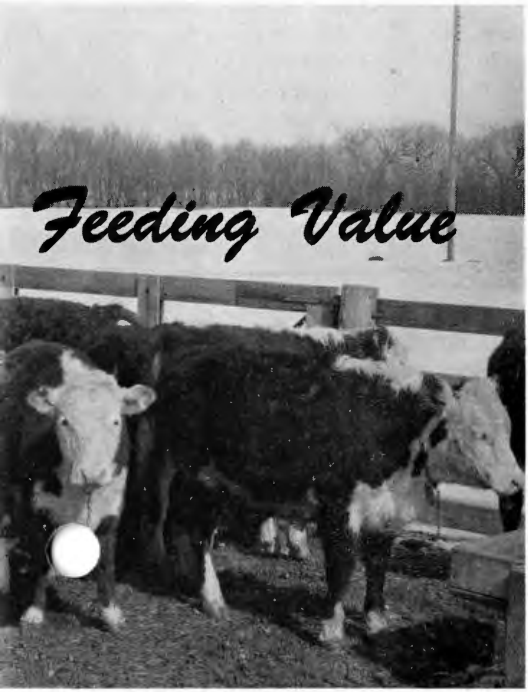
During the past few years research has been conducted to gain information on when prairie hays should be harvested for highest feeding value. The hays used in the study are designated Early, Medium, Late, and Storage hays. The early hay is usually cut between July 1 and July 15 when the seed stalk is in a "shooting" stage. Medium hay is cut in August at a "seed ripe" stage, usually after August 15. Late hay is cut in a mature and over-ripe, or "seed falling," stage usually from Sept. 20 to early October. Storage hay is harvested at an early stage of maturity and tested over a period of years to determine the effects of storage on nutritive value.

These hays from three of our substations, Cottonwood, Highmore and Eureka, have been tested in feeding and digestion trials. The digestion trials are more technical in nature than the feeding trials and serve as a check on the feeding trials as well as give additional information on how the proportions of the various nutrients found in the hays influence digestibility.

Early-Cut Hay Gives Highest Daily Gains

Table 1 summarizes the results from the 1949-50 feeding trials conducted at Cottonwood. Each lot was fed the same amount of hay and sup-

plemented the same except that the pelleted soybean oil meal in Lot 6 contained 5 percent molasses and 5 percent urea. The early hay showed the highest daily gain (1.07 lbs.) closely followed by the one-year-old storage hay (1.02 lbs.). The lot receiving medium hay, was in third place with respect to gains (0.90 lbs. average daily gains) closely followed by the two lots receiving the two-year-old storage hay (0.88 and 0.87 lbs.), showing that the supplement containing urea and molasses gave almost identical gains when compared to plain, pelleted soybean oil meal. The lot receiving the late-cut hay showed the lowest gains with 0.72 pounds average daily gain per head. Although needles were observed in each of the various cuttings of the hay, no trouble from needles has resulted during any of the feeding or digestion trials since this experiment was started.



Savings of 500 to 600 lbs. of hay, over 40 lbs. of oats and 40 lbs. of soybean oil meal per 100 lbs. of gain resulted when early rather than late-cut hay was used in wintering calves

3-Year-Old Storage Hay Ranks High in Producing Gains

Results of the 1949-50 feeding trials at Eureka showed that the early and medium-cut hays in this trial gave gains that were identical. The hays were supplemented with 1 pound of oats and 1 pound of pelleted soybean oil meal, and the lots receiving the early and medium-cut hay rations produced 1.5 pounds average daily gain. The three-year-old storage hay closely followed these lots in producing gains, and the 1.4 pounds average

Table 1. Feeding Results 1949-50 at Cottonwood—Fed 112 days

	Lot 1 1-yr. storage hay plus supplement*	Lot 2 Late-cut hay plus supplement*	Lot 3 Early-cut hay plus supplement*	Lot 4 Medium-cut hay plus supplement*	Lot 5 2-yr.-old storage hay plus supplement*	Lot 6 2-yr. old storage hay plus urea supplement†
Average daily gain	1.02	0.72	1.07	0.90	0.88	0.87
Feed offered per 100 lbs. gain						
Hay	1109.8	1538.9	1039.4	1225.4	1250.4	1257.6
Protein supplement	95.6	132.7	89.63	105.7	107.8	96.9
Oats	100.1	138.9	93.8	110.6	111.9	112.3
Percent of hay refused	9.91	13.10	14.54‡	10.87	8.67	8.46

*Supplemented with 1 pound each of pelleted soybean oil meal and oats per head daily.
†Supplemented the same as other lots except pelleted soybean oil meal contained 5 percent urea and 5 percent molasses.
‡It was noted that the early-cut hay contained larger than average amounts of "buck brush," *Symphoricarpos orbiculatus*, which accounted for most of the refused material here.

daily gain here was far superior to the 0.83 pound average daily gain produced in the lot receiving late-cut hay. The storage hay used in this trial was baled, stacked in a large pile and the pile topped with loose hay.

500 to 600 Pounds of Hay Saved on Early Ration

Experiments in wintering beef calves have shown that a gain of about 0.75 pound to 1.0 pound is a desirable level of nutrition. A calf should gain nearly 100 pounds during the wintering period. Comparing the early-cut hay ration with the late-cut hay ration in producing 100 pounds of gain, the early ration at Cottonwood saved 500 pounds of hay, 53 pounds of 40 percent pelleted soybean oil meal and 45 pounds of oats. Similar comparisons with the Eureka feeding trials show a saving of 605 pounds of hay, 43 pounds of oats and 43 pounds of pelleted soybean oil meal, where early-cut hay is used rather than late-cut hay to produce 100 pounds of gain. The storage hays would rank intermediate between the early-cut and late-cut hays in regard to feed saving per 100 pounds gain. These savings at feed prices during the past winter would result in savings of from $6.00 to $8.00 per calf, wintered under the conditions found in these experiments.

Early Hay Has 70 Pounds More Protein Per Ton

Protein is perhaps the most important nutrient in prairie hay; at least it is the nutrient most apt to be deficient and is an expensive nutrient to furnish. The 1948 yield of protein per acre at Eureka was 89.7 pounds for early-cut and 60.2 pounds for late-cut hay. The per acre protein yield for the Highmore hay in 1948 was 107.4 pounds for the early, and 37.5 pounds for the late-cut hay. The early hay produced an average of 49.9 pounds more protein per acre, or over 70 pounds more protein per ton, as an average for these two stations than did the late-cut hay. It would require more than 150 pounds of 40 percent protein supplement added to each ton of late-cut hay to furnish the same amount of protein produced in a ton of the early-cut hay.

Digestibility of Late-Cut Hay Lower

The 1949 digestibility studies are the only ones complete, at present, which have not been previously reported. Table 2 shows the chemical composition and the coefficients of apparent digestibility for early, medium, and late-cut hays and two-year-old storage hay cut at an early stage of maturity. Both steers and lambs were used in testing these hays.

When hays of low protein content are fed alone they do not furnish as digestible a ration as when some protein supplement is added. This is attributed to the fact that protein is required to stimulate the growth of bacteria in ruminants; these bacteria are largely responsible for the breakdown of fiber and coarse materials, which in turn accounts for the greater efficiency with which sheep and cattle can utilize forages when compared to pigs, poultry, or other animals lacking such bacterial action.

From Table 2 it can be seen how poorly digested the protein of the late hay is, compared to the other hays. In these trials the early hay furnished more than five times as much digestible protein for steers as did the late-cut hay, while the same comparison with lambs showed the early-cut to furnish

Table 2. Chemical Composition and Coefficients of Apparent Digestibility (Steers and Lambs) of Eureka Hays—1949

	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen-free extract
Chemical Composition percent					
Early	91.30	**7.08**	2.56	29.50	41.67
Medium	91.32	**6.60**	2.64	29.42	43.49
Late	91.79	**4.75**	3.10	30.37	43.64
2-year-old storage hay	91.44	**8.35**	2.60	29.85	41.04
Average coefficient of digestibility					
Early hay					
Steers	46.51	**41.15**	29.11	62.95	47.99
Lambs	40.55	**34.38**	19.12	54.03	46.66
Medium hay					
Steers	42.63	**29.80**	21.98	56.62	46.66
Lambs	40.25	**30.35**	15.34	55.38	42.36
Late hay					
Steers	40.51	**11.88**	37.39	56.96	43.79
Lambs	37.90	**12.56**	34.81	55.28	39.92
Storage hay					
Steers	46.44	**45.98**	34.60	59.26	47.04
Lambs	44.29	**40.86**	46.77	52.76	47.00

more than four times as much digestible protein as did the late-cut hay. (Found by multiplying the percent of chemical composition by the digestibility coefficient of the protein.) These studies show how the late-cut hay has two strikes against it: *first, late-cut hay contains considerably less protein than the early-cut, and second, the digestibility is much lower in the small amount of protein which the late-cut hay does retain.*

Acre Yields Average Higher for Early-Cut Hay

Acre yields of dry matter may prove to furnish the means of calling the third strike on the late-cut hay. Following is presented the pounds of dry matter produced per acre (an average from three stations) during two years.

Table 3. Pounds of Dry Matter Produced Per Acre (Average for Three Stations, Eureka, Highmore and Cottonwood)

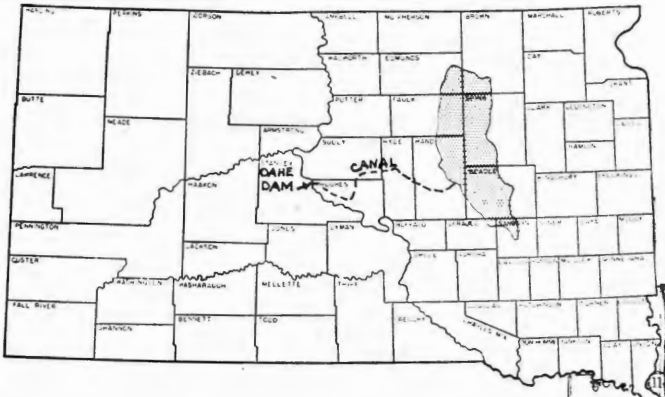
	Early	Medium	Late
1948	1149.6	1024.6	970.7
1949	1376.0	899.2	743.3

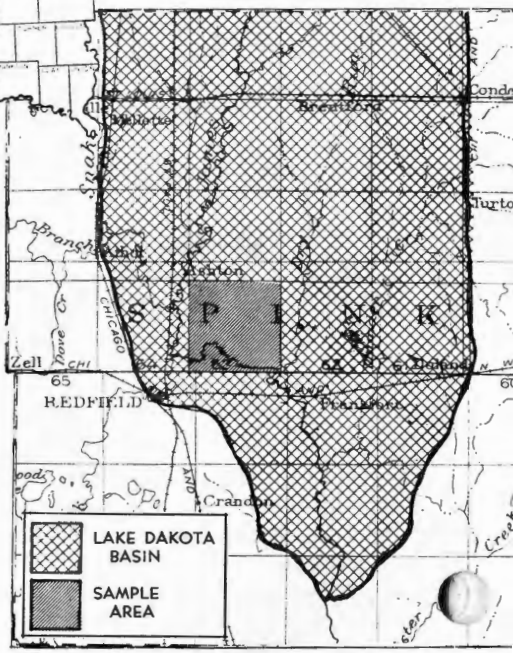
In only one instance did the late-cut hay produce more pounds of dry matter than did the early-cut hay (late-cut at Eureka exceeded early by 5 pounds dry matter per acre in 1948); during all other years and at all other stations the early hay led in producing dry matter.

It Makes a Difference

Early cutting of prairie hay produces more nutrients per ton and per acre than does late cutting. Medium cutting is intermediate between early and late in producing nutrients, and both early and medium cutting is preferred greatly to late cutting in producing feed nutrients. Hay stored three years retains much of the original nutritive value, but should be cut early and well stacked for best results. If the operator wants to feed about one-third less hay and save on the concentrates, he should make hay in July rather than late September or October.

(Continued on Page 100)





Left: The original Oahe area, showing where the new irrigation project will be. Center: Spink County, South Dakota, showing location of Lake Dakota Basin. Lower right: A soil scientist using a permeability rack to measure how much water comes through the soil in a certain period of time. Soil samples are taken in brass cylinders and water is made up to simulate the composition of Missouri River water with the same salt content.

Soils Surveyed for Irrigation in Spink County

By F. C. Westin

The success of the Oahe irrigation project, or any other irrigation project, depends ultimately on two things—how well-adapted the soils are for irrigation and how successfully the good soils can be kept in a favorable condition under irrigation. The basic soil survey being conducted in Spink County by the South Dakota Experiment Station, cooperating with the United States Department of Agriculture, will assess the adaptability of Spink County soils for irrigation as well as answer some of the needs of dry land farmers.

However, the problem of successfully maintaining the soils in a favorable condition is much more difficult to deal with. It involves, among other things, keeping a favorable calcium saturation in the soils and preventing an unfavorable sodium saturation from developing.

Calcium or Sodium—It Makes a Difference

The amount of calcium or sodium present is extremely important in managing soils especially if they are under irrigation. If the calcium content of the soil is high the clay acts as a glue and binds the soil particles together as granules. This imparts a favorable physical condition to the soil allowing free passage of water, air and plant roots. When the clay plates are

saturated with sodium, however, the opposite effect is achieved. The clay no longer acts as a glue, and the clay particles slide easily over one another, causing breakdown of the soil granules with loss of good physical condition. The soil no longer affords free passage to water, air and plant roots. This process takes place rapidly in soils having sodium-saturated clays if these soils are cultivated or disturbed when wet. It also takes place naturally as a soil-forming process, and is responsible for the fairly common claypan soils developed in the Oahe area.

The soil survey of Spink County separates soils where this process (called solonization) has already taken place from soils not yet affected. One of the most important soil management practices in Oahe, if and when irrigation comes, will be the prevention of solonization by maintaining in the soils a calcium saturation and by preventing a sodium saturation from developing.

Sodium saturation may develop in soils in three principal ways: by accumulation of sodium carried in by the irrigation water, by raising of the water table, or by rise of dissolved sodium through the soil by capillary action (rise of a liquid similar to the rise of kerosene in a wick). The capillary water itself evaporates leaving a concentration of sodium in the soil.

Fortunately it appears that the Missouri River water anticipated for use on the Oahe project will not result in a harmful accumulation of sodium. Preventing a sodium accumulation from developing due to capillary rise or water table elevation appears to be a problem of considerable magnitude, however. Solving it will involve establishment of an adequate drainage system for the project.

Soils of Oahe Are Variable

A large part of Spink County is located within the Oahe area. (See map, page 92.) The Experiment Station and its cooperating USDA agencies have covered approximately 300,000 acres in the basic soil survey of Spink County. Most of this surveying has been in the so-called Lake Dakota basin (See map, page 92) and a smaller part in the glacial till plain. Four of the Lake Dakota basin soils will illustrate most of the soil problems encountered over the course of the survey. These four soils are: Bearden G_1, Abbe, Aberdeen, and Exline. They have all developed from the same parent material, (water deposited silts and very fine sands,) but different kinds of profiles have formed due to

the influence of topography and salt concentration.

Bearden has developed on gently undulating topography, has a deep mellow profile and no claypan. Abbe has formed on almost level topography, is deep and has a slight claypan. Aberdeen has developed on level topography, has a moderately hard claypan, and Exline has developed on level depressional topography and has a very hard claypan.

Permeability studies on these soil profiles, or studies showing the ability of soils to permit passage of water, indicate that the Exline claypan is impermeable (not permitting passage) while the claypans of Abbe and Aberdeen are moderately permeable. The Bearden profile is also permeable. Permeability studies on the parent materials (lake-laid silts and clays) for these soils show a low degree of permeability.

The amounts of total clay (particles less than .002 millimeters) for these four soils present in the B_2, or claypan, layer is shown in Table 1.

Table 1. Percent Clay in B_2 or Claypan Layer of Four Lake Dakota Basin Soils

	Bearden G_1	Abbe	Aberdeen	Exline
Percent Clay	23.5	35.5	39.9	36.4

These data seem to conflict with the field appraisal of the degree of compaction (unfavorable condition of the soil which does not readily allow for the passage of air and water) in which Exline was the most compact, and also the most impermeable. Exline may actually have a smaller percentage of total clay than either Abbe or Aberdeen. The explanation for this apparent inconsistency can be found in Table 2, which lists the percentages of sodium and calcium in these soils. It can be seen from this table that the Exline soil has an extremely high sodium content compared to the other three soils.

Table 2. Water Soluble Sodium and Calcium in B_2 or Claypan Layer of Four Lake Dakota Basin Soils (Milliequivalents per 100 grams)

	Bearden G_1	Abbe	Aberdeen	Exline
Sodium	0.09	0.35	0.26	5.0
Calcium	0.31	0.20		5.95

From this it can be inferred that our field mapping units based on degree of compaction actually tell us what is the relative sodium saturation of the soil. Another conclusion which can be drawn from this, is *that the Abbe and Aberdeen soils and possibly the Bearden soils are potential Exline soils. If proper precautions to prevent sodium saturation are not taken, some of the best soils in the Lake Dakota basin in Oahe can be changed to non-irrigable soils in a matter of a few years.*

Percent of Irrigable Land Classified

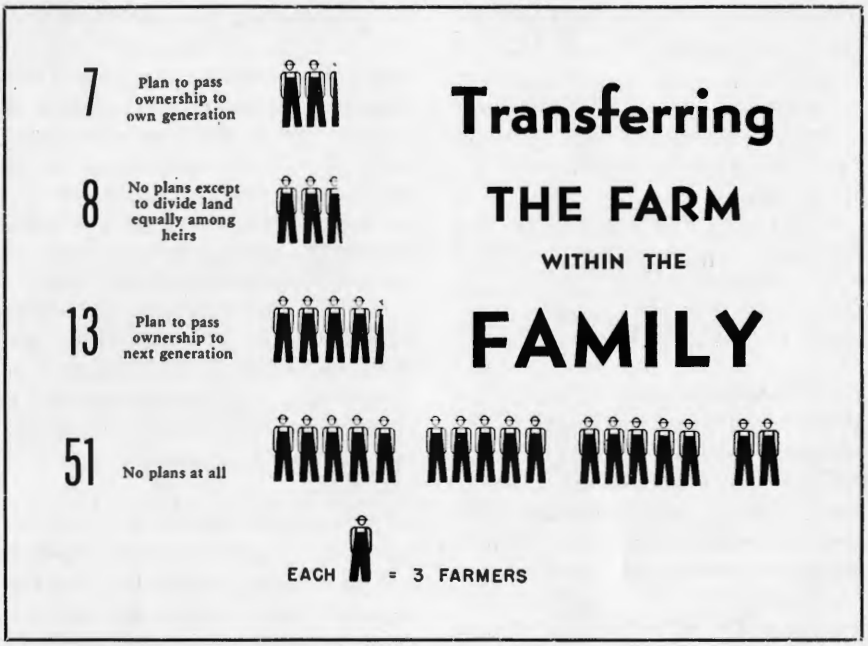
The results of mapping have not been completely tabulated as yet to show the actual percentages of the various classes of land. However, preliminary work on a typical township in Lake Dakota basin. (See map) showed the following classes of soil.

Table 3. Soil Classes in T117N R63W Spink County, South Dakota

	percent		percent
Class I	.5	Class IV	32.0
Class II	10.5	Class VI	32.0
Class III	25.0		

The word "soil" used in the term "soil classes" in Table 3 means soil in its broad sense, that is, the natural landscape. This however does not in-

(Continued on page 100)



Seventy-nine South Dakota landowners. What will become of their farms?

By Max Myers

"I haven't thought about it . . . but maybe I should!"

That was the most common reply when almost two hundred farm families were asked about the disposition of their farms. Entirely too many farm owners—most of them in fact—die before they get around to making a decision as to who gets the farm. The families, the farms, and the public will benefit if farm transfer arrangements are made more carefully and sooner.

Many farmers want to keep their farms in their own families for future generations. There are sound reasons to support this desire for those on adequate and efficient farm units. One of these reasons is that a farm transferred within the family can more easily be transferred as a "going concern."

One has only to look around the average farming neighborhood to realize that relatively few farms stay in the same family for successive generations, and that even fewer farms are transferred as complete, operating businesses. Generally the retiring farmer sells his stock and equipment at public auction, takes his valuable management knowledge off the farm and lets a new operator learn by trial and error.

Specific evidence as to the ways in which South Dakota farmers acquire and dispose of land was gathered during 1947-48 from a study of the tenure histories of 144 families who have operated or owned 130 farms in South Dakota counties. Of these, 107 owned, or had owned, land, but only 20

owned land which had been acquired by an earlier generation of the same family.

Ninety-one percent of the acreage acquired was obtained from non-relatives. Inheritance clearly played a small part.

There are numerous reasons why farms do not stay "in the family." These include the lack of heirs, or the unwillingness of heirs to farm, inadequate size of farm business, lack of capital and reluctance to discuss the disposition of property or to take any action until after the death of the owner. However, there are many families which have a suitable business which they wish to transfer to the next generation. What can they do about it?

Points to Consider

No two farm family situations are exactly alike. Therefore no one definite plan can be laid down for use by all farm owners. The study of many farm family situations and the experience of many South Dakota attorneys, as brought together in this report, seem to indicate that the following points are important:

A. It is rather generally believed that there are benefits to individuals, families, communities, and the public if successful farm businesses are handed down as going concerns through the right kind of farm families.

B. Some farms probably should not be kept in the family. Unless the business is adequate in size and efficiency to support a family and sometimes two families, there is little reason to make the effort necessary to keep one of the children on it.

C. If a given farm business is adequate and if it is desired to keep it in the family, then the next question is that of deciding who is willing and able to take over from the present owner. For families with children this may raise the problem of creating in at least one of them an interest in farming and in continuation of the home farm business. This interest cannot be created overnight just when the parents wish to retire. It is something that starts in childhood, possibly with small shares in farming such as 4-H and F.F.A. projects, and the continuation of such interest is frequently tied to an understanding by the young man or woman of how the home farm is to be passed on and to whom.

D. The family should be able to discuss future plans for the farm business and the eventual disposition of the property, to discuss this sensibly and with a realization that different members have different interests. This should be done early. Some decisions should be made before all the children choose other paths and leave home. It seems preferable that these decisions and the necessary legal arrangements be made long before the parents expect to leave this world or even to retire. This does not necessarily mean that title to property has to be transferred early, but some definite plans should be made. Such planning and action can forestall friction and uncertainty within the family. It can take into account the effects of taxation and make it possible to avoid losses to the family or the farm and unnecessary expenses to the future estate.

E. There are various alternative methods or legal devices which can be employed to put the family's plans into effect. These devices differ and are suited to different situations.

Legal Ways of Transferring Farm Ownership

The principal alternatives which lie before the farm owner who is considering the disposition of his property are these:

1. The laws of inheritance (or descent)—The owner may make no disposition or plans. After he dies intestate (without a will) the courts will make disposition of the property to the heirs.

2. A will—He may bequeath the property in a will, and specify who gets what and on what terms.

3. Joint tenancy—He may hold the property in joint tenancy with right of survivorship so that when he dies the property will pass to the other person or persons named in the title.

4. Gifts of property—He may give his farm away before he dies, or he may give future title but retain life use of it.

5. Sales of property—He may sell the farm, either outright or with various restrictions.

6. Incorporation—He may incorporate the farm business, and then dispose of shares in the corporation by methods listed above.

Many Interests to be Reconciled

Several sets of interests must be reconciled in order to accomplish a successful family transfer of a farm business. These interests include:

1. The needs of the parents (landholders) for security of income as long as either lives. This is particularly important when the farm is their only property.

2. The desire of the young man and his family for security of expectation, that is, the certainty that they will own the farm if they work on it and improve it.

3. The interests of other heirs in the family, who under the American way of doing things, expect to receive equal or equitable treatment.

4. The interests of the farm, which should not be deteriorated in the process of farming or of transferring the farm. The community and the general public also have an indirect interest in the farm—an interest in efficient, continuous production of foods.

The importance of each of these interests will vary from family to family and from time to time. The problem, then, is to select arrangements which will fit the particular combination of circumstances in the individual case.

It is difficult to rank one method as better than others, but certain generalizations can be made. For the farm owner who must depend on the income from the farm as long as he lives, the disposition by means of a will is probably most suitable. In situations where it is more important to give the next generation certainty that they will get the farm, it is probably most satisfactory to sell the farm to them when the owner is ready to retire. However, in both these situations a case can be made for the use of a deed with a retained life interest to the parents. The land owner should decide what he wants to do.

A matter as important as the arrangements for transfer of farm property should never be undertaken without competent legal advice and assistance. A lawyer can advise the farm owner as to the effect of various plans and methods on the farmer's particular situation. Once the owner has decided what he wants to do the attorney can tell him how to do it legally. (Project 166, Agricultural Economics.)

Sprinkler

To Obtain Uniform
In Areas of High

By JOHN L. WIERSMA

SPRINKLER IRRIGATION was developed in an area where average wind velocities are 2 miles per hour or less and the maximum velocity seldom exceeds 4 miles per hour. Standard designs are based on this figure. In South Dakota the average wind velocity is between 10 and 11 miles per hour with maximum velocities much greater than this. Therefore, our sprinkler designs must be modified to compensate for this difference.

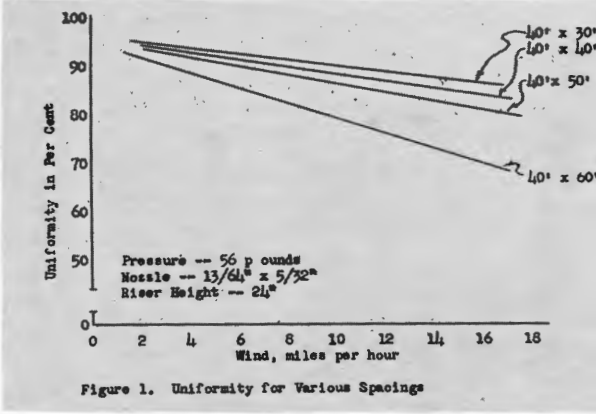


Figure 1. Uniformity for Various Spacings

Common methods of getting a more uniform water coverage to compensate for the wind distortion are to use increased riser pressure, closer spacing of the sprinklers on the line and shorter moves between lines, larger nozzles, and special type heads.

Increasing Water Pressure Improves Distribution

Increasing the water pressure will improve the water distribution. The maximum usable pressure will be limited by the pump operating cost and will not be determined by the uniformity of the water distribution. Higher pressures will increase pumping cost considerably. However, in a 10 mile-per-hour wind a riser pressure of 50 pounds per square inch will result in about 10 percent better pattern than a pressure of 40 pounds per square inch. A pressure increase from 50 pounds to 60 pounds per square inch will increase the uniformity only about 5 percent.

Spacing of Sprinkler Heads Tested

Closer spacing of the sprinkler heads on the line and shorter moves between lines will also aid in more uniform water application. Labor costs will be increased if the move between lines is decreased. The expected uniformity for various moves is illustrated in Fig. 1. It is noted that there is little difference in a 30-foot, 40-foot and a 50-foot move in a 10 mile-per-hour wind. However, there is a considerable difference between a 50-foot move and a 60-foot move. The tests for determining these lines were run

Irrigation

Water Distribution Wind Velocities

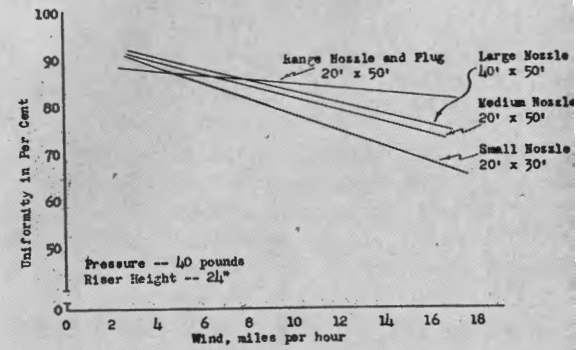


Figure 3. Comparison of Uniformity for Equal Precipitation Rate

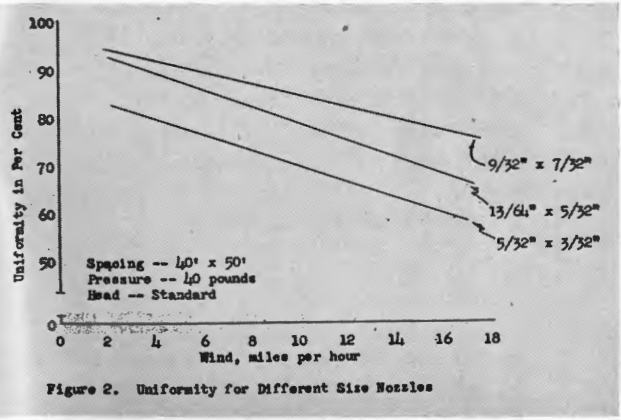


Figure 2. Uniformity for Different Size Nozzles

using a medium weight sprinkler head mounted on a 24-inch riser. The nozzles used applied 13 gallons of water per minute, at 56 pounds pressure.

A sprinkler head from which the spreader nozzle has been removed and replaced with a plug and only the range nozzle is used will also aid in obtaining more even water distribution during winds of 8 miles per hour or greater. The top line in Fig. 3 represents the expected uniformity for a spacing of 20 feet between sprinklers and a 50-foot move between lines. It is noted that other type heads and nozzles are superior for lower wind velocities.

Large Nozzle More Efficient

The size of nozzles used will also affect the distribution. The type soil, work schedule, and the rate at which the water is available will usually determine the nozzle size that can be used, but if a choice can be made, the larger nozzle will help to obtain more uniform water distribution. In Fig. 2 conditions were identical with the exception of the size of nozzle used. The large nozzle would apply about 21 gallons of water per minute, which is equal to a precipitation rate of about one inch per hour when spaced 40 feet between sprinklers and moved 50 feet. The medium size nozzle would apply about 13 gallons of water per minute, which is equal to 0.6 of an inch of water per minute with the same spacing, and the small nozzle will apply about 6.5 gallons per minute which is equal to 0.3 inches of precipitation per hour. It is noted from Fig. 2 that for low wind velocities there is little difference, but as the wind velocity increases the difference becomes more noticeable. The larger nozzle is superior to the small nozzle.

Type of Nozzle Head Makes a Difference

Figure 3 shows a comparison for different nozzles and spacings in

which the precipitation rates are approximately equal. The pumping costs would be identical because the same pressure was used throughout the entire comparison. For winds of 8 miles per hour or greater the head with only a range nozzle and a plug in the spreader nozzle, spaced 20 feet on the line, is superior to any other in this comparison. The labor costs for these three comparisons would be identical. A small nozzle placed 20 feet apart on the line and moved 30 feet between moves is not as good as the larger nozzles with greater spacing. There would be twice as much labor involved in doing this. A large nozzle spaced 40 feet between heads and moved 50 feet will give about an identical pattern as a medium-size nozzle placed 20 feet on the line and moved 50 feet between moves. The latter method would be more expensive because twice as many sprinkler heads would be required per line.

In determining a suitably designed sprinkler irrigation system, all factors such as available labor, pumping costs, maximum allowable precipitation rate, location of the system, and type of crop grown must be given consideration before the desired uniformity of water application can be attained. (Project 192, Agricultural Engineering Department.)

(Harvesting Hay, Continued from page 89)

Technique Improved

A by-product of these studies which is of more interest and value from a technical standpoint than from a popular standpoint was a comparison of 7-day collection periods versus 10-day collection periods in determining digestion coefficients. The 10-day period is most commonly employed. A study involving 27 comparisons in which double feces samples were collected over 7 and 10 day periods and analyzed, showed the loss in efficiency when 7-day periods were used rather than 10-day periods was very small except for nitrogen-free extract.

Except for nitrogen-free extract, none of the other efficiency losses (computed from digestion coefficients) reached 2 percent. On the basis of these findings the shorter period is being used for the 1950 trials. (Project 120. Leaders: George Staples, R. M. Jordan, Animal Husbandry Department; A. L. Moxon, Chemistry Department; J. G. Ross, Agronomy.)

(Soils, Continued from page 94)

clude an item such as overall drainage.

Class I soil is that ideally suited for irrigation at the time of the survey. It occurs on a favorable slope, has no clay pan or other impermeable layer, is low in sodium and other harmful salts, has a deep profile and is not stony. Class II soil is less suited for irrigation than Class I. This may be due to less favorable conditions of slope, permeability, sodium, depth of soil, or stoniness. Class III soil is again less favorable than II. Class IV soil is considered as being suitable only for irrigated pasture and Class VI is unsuitable for any kind of irrigation.

Thus from this sample area, and from the basis of soils alone, 36 percent of the soil falls into one of the first three classes which are considered as being irrigable, while 32 percent appears suitable only for pasture and 32 percent seems unsuitable for any type of irrigation. (Project 183, Leaders: F. C. Westin, A. J. Klingelhoets, G. B. Lee, W. Moldenhauer, D. Kettering, Agronomy Department.)

CONTROL INSECTS . . . IN *Alfalfa* FIELDS

By H. C. Severin

Harmful insects in an alfalfa field must be destroyed if alfalfa seed growers expect to produce a good seed yield. At the same time, the beneficial pollinating insects should be encouraged. Among the most harmful insects affecting the seed yield of alfalfa in South Dakota are grasshoppers, crickets, Lygus and other plant bugs, clover, potato and other leaf hoppers, and flea beetles.

Control of Grasshoppers and Crickets

Grasshoppers and crickets may be controlled through the use of chlordan or toxaphene. DDT does not do a good job of killing crickets. When chlordan or toxaphene are applied in spray forms, the materials should be used as emulsions or wettable powders. For best results when spraying, use per acre:

Chlordan ..... ½ to 1 lb.
Water ..... 15 to 100 gallons (depending on spraying equipment and water available)

or

Toxaphene ..... 1 to 1½ lbs.
Water ..... 15 to 100 gallons (depending on spraying equipment and water available)

When these materials are to be applied in dusts, use per acre:

Chlordan ..... ¾ to 1½ lbs., or
Toxaphene ..... 1½ to 2½ lbs.

If the grasshoppers and crickets are adult, or the stand of alfalfa thin, the amount of chlordan or toxaphene that is applied per acre should be increased at least one-half.

Flea beetles and plant bugs may also be destroyed through using chlordan or toxaphene, but these insecticides have little effect on leaf hoppers.

Using DDT to control Lygus and Other Plant Insects

DDT can be applied to alfalfa either in a liquid spray or in a dust. For the control of Lygus and other plant bugs and for the control of leaf hoppers, alfalfa should be treated when the field is in the pre-bloom stage. Use per acre:

DDT emulsion ..... 1 to 1½ lbs. total DDT
Water ..... 15 to 100 gallons (depending on spraying equipment and water available)

When dusting DDT, use per acre:

DDT dust (20 lbs. of 10 percent DDT or 40 lbs. of 5 percent) ..... 2 lbs. total DDT

Flea beetles can be readily controlled by any of the three insecticides mentioned. It is possible to combine DDT with either chlordan or toxaphene to make a satisfactory liquid spray or dust.

Avoid Warm Daylight Hours When Spraying

An alfalfa field that is in heavy bloom should not be sprayed or dusted with any of the insecticides during the warm daylight hours. If it becomes necessary to treat such a field, then the alfalfa should be sprayed or dusted at night, early in the morning, or late in the afternoon when bees are not pollinating the flowers. (Entomology Department.)

NEW PUBLICATIONS

South Dakota Agricultural Experiment Station

South Dakota State College
BROOKINGS

C 80 Head Lettuce, Varieties and Cultural Practices, by S. A. McCrory. (8 pages)

One of the main problems in growing head lettuce is the selection of a quick heading variety of good quality and good yield. This circular reports the results of tests of standard varieties, as well as the investigation of plant growing practices that would encourage maximum heading of lettuce before temperatures exceed 80°. Also reported is the use of fertilizers and manure in hastening maturity.

C 81 Grasses and Legumes for South Dakota, by J. G. Ross, M. W. Adams, A. N. Hume, and W. W. Worzella. (16 pages)

The description and adaptation of important grasses and legumes for South Dakota. Results of yield tests conducted by the Experiment Station are given. Recommendations are made as to pasture and hay mixtures for the different agricultural areas of the state and suggestions for establishing stands.

B 398 Keeping Your Farm in the Family, by Max Myers. (24 pages)

Too many farm owners die before getting around to making a decision as to who gets the farm, according to an agricultural economics survey. The families, the farms, and the public will benefit if farm transfer arrangements are made more carefully and sooner. The bulletin discusses legal ways of transferring farm ownership and gives suggestions on points to consider when entering into an arrangement for farm transfer.

B 399 Rations for Wintering Breeding Ewes, by R. M. Jordan. (8 pages)

Feeding trials were conducted to determine the practicability and economy of feeding breeding ewes a mixture of brome and alfalfa, or brome supplemented with soybean oil meal as a substitute for straight alfalfa.

B 400 Galvanized or Painted Steel Fence Posts, by Dennis L. Moe. (4 pages)

This bulletin reports the merits of galvanized steel fence posts as compared to common painted steel posts, length of service, and the types of paints used.

B 401 James Hulless Oats, by J. E. Grafius and V. A. Dirks. (4 pages)

A new hulless oats, James, is stiff-strawed, mid-early and has produced a high yield of good quality grain in eastern South Dakota. James has the White Russian type of stem rust resistance and the Bond type leaf rust resistance and is resistant to both loose and covered smut.

You may obtain copies of these publications from your county agent, or by addressing a request to the Bulletin Room, Agricultural Experiment Station, South Dakota State College, Brookings