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# Effects of Irrigation on an Adjoining Ranch Economy

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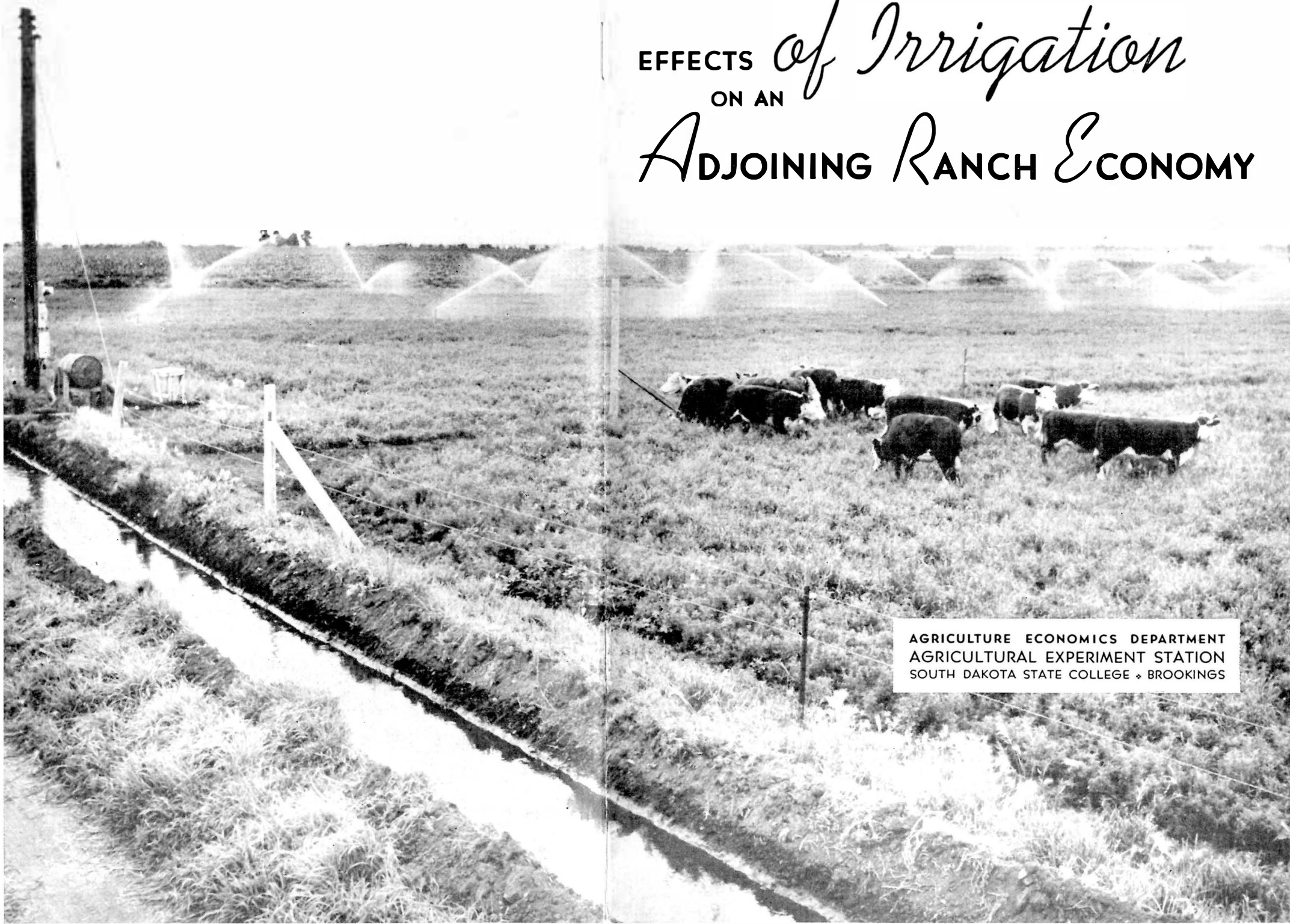
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# EFFECTS *of Irrigation* ON AN *ADJOINING RANCH ECONOMY*



AGRICULTURE ECONOMICS DEPARTMENT  
AGRICULTURAL EXPERIMENT STATION  
SOUTH DAKOTA STATE COLLEGE ♦ BROOKINGS

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# Effects of Irrigation on an Adjoining Ranch Economy

WILLARD SCHUTZ<sup>1</sup>

## Introduction

To determine whether irrigation development in western South Dakota is economically worthwhile, one must consider the stabilization effects it would have on the ranching economy of the area.

Irrigation development is going forward. The Angostura Unit on the Cheyenne River is now partially irrigated. Additional water for the long established Belle Fourche Project has been made available from the Keyhole Dam in Wyoming. The Bureau of Reclamation has extensive plans for pump irrigation along the Missouri River and its tributaries. The Oahe Dam is under construction. Proposed irrigation of 750,000 acres from water impounded by this dam greatly overshadows all previous irrigation developments in South Dakota. The Shadehill Dam on the Grand River has been completed.

Investigations to determine the feasibility of irrigation in the Oahe area and from Shadehill Dam are under way. These developments require large outlays of public funds, and their effects touch not only the people in the area but their neighbors, the state, and the nation.

In western South Dakota less than 10 percent of the farms and ranches have some irrigation, according to the 1950 Census of Agriculture. Some of this land is irrigated from streams, small private reservoirs, or wells. Other land is irrigated by water made available by large government-sponsored irrigation developments such as the Belle Fourche project. A few farmers and ranchers have feed bases on such projects even though their main unit is some miles away. But 90 percent of the operators in western South Dakota have no irrigation.

## The Problem

Do the larger irrigation projects help stabilize the feed supply of adjoining dryland farms and ranches which do not control any irrigated land? If they do, then one should consider such benefits when he evaluates the desirability of spending public funds for irrigation projects in high-risk areas. If there are stabilization benefits for off-project farmers and ranchers, then pump irrigation along the Missouri River

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This report is the result of a cooperative project with the Bureau of Reclamation, Department of Interior, Project No. 1 79r-798, Supplement No. 6.

and its tributaries can be more easily justified. Likewise, if such benefits do exist, Oahe Dam on the Missouri River may be justified in part by off-site benefits to farmers in this high-risk area.

### **Purpose of Study**

The purpose of this study was to determine the probable stabilizing effects of feed produced on irrigated farms on adjoining dryland ranches in western South Dakota.<sup>2</sup> This study was made in a ranching area where hay supplies are an important stabilization factor in case of winter storms or drought. Thus, major emphasis was placed on determining to what extent hay produced on irrigated farms stabilized dryland farms. In addition, some attention was given to effects of combining an irrigated project with adjoining dryland, neither of which was of a strictly stabilization nature.

### **Procedure**

To determine the probable stabilizing effects of irrigation-produced feed on nearby dryland ranches, information was needed concerning feed sales from irrigation projects and feed purchases by these dryland ranches. The best source of such information appeared to be the farmers and ranchers in those areas of western South Dakota where irrigation was being practiced or expected. Therefore, the information presented was mainly obtained from interviews of farmers and ranchers on or near five irrigation projects west of the Missouri River (Table 1).

These projects were the Angostura Unit, Cheyenne Pumping Unit,

Belle Fourche Irrigation Project, the nearby Redwater Irrigation Area, and the Mirage Flats Irrigation Project in northwestern Nebraska. The location of these projects can be seen from the map in Fig. 1.

Information was secured from 166 operators; 60 by personal interviews and 106 through group interviews. Since the boundaries of the adjoining dryland areas which might receive stabilization benefits could not be established with the resources available no attempt was made to draw a random sample of ranchers to be interviewed. The ranches varied greatly in size, in location of headquarters with respect to the irrigated area, and in accessibility of the headquarters to the irrigation area even when some land adjoined the projects.

Additional data were obtained through group interviews in the Mirage Flats and the Belle Fourche irrigation areas. Since the interviews were made in agricultural veteran training classes, those interviewed included a disproportionate number of young operators who were just starting farming or ranching.

### **Where the Study Was Made**

This study was primarily centered around the possible stabilization benefits to adjoining dryland ranches of the Angostura Irrigation Unit and that portion of the Cheyenne Pumping Unit which stretches for 90 to 100 miles along the Chey-

<sup>2</sup>In this report the term, "farmer" or "irrigation farmer" is used when reference is to an operator on a going irrigation project. All other operators are termed ranchers or drylanders, and when they have irrigation it is so indicated.

enne River in southwestern South Dakota. The Angostura Unit extends for about 30 miles along the upper portion of the Cheyenne River with a maximum width of about 3 miles. That portion of the Cheyenne Pumping Unit included in the study area extends from the Angostura Unit to the mouth of the Cheyenne River—a distance of 60 to 70 miles.

Nearby irrigation projects, Belle Fourche and Mirage Flats, were studied to anticipate probable results pending irrigation in southwestern South Dakota (Fig. 1). While the area of study was limited, findings should be generally applicable to western South Dakota.

Raising cattle and sheep is of primary importance in the area. On many units livestock production is

Figure 1. Location of ranchers interviewed along the Cheyenne River and irrigation areas included in the study, southwestern South Dakota.

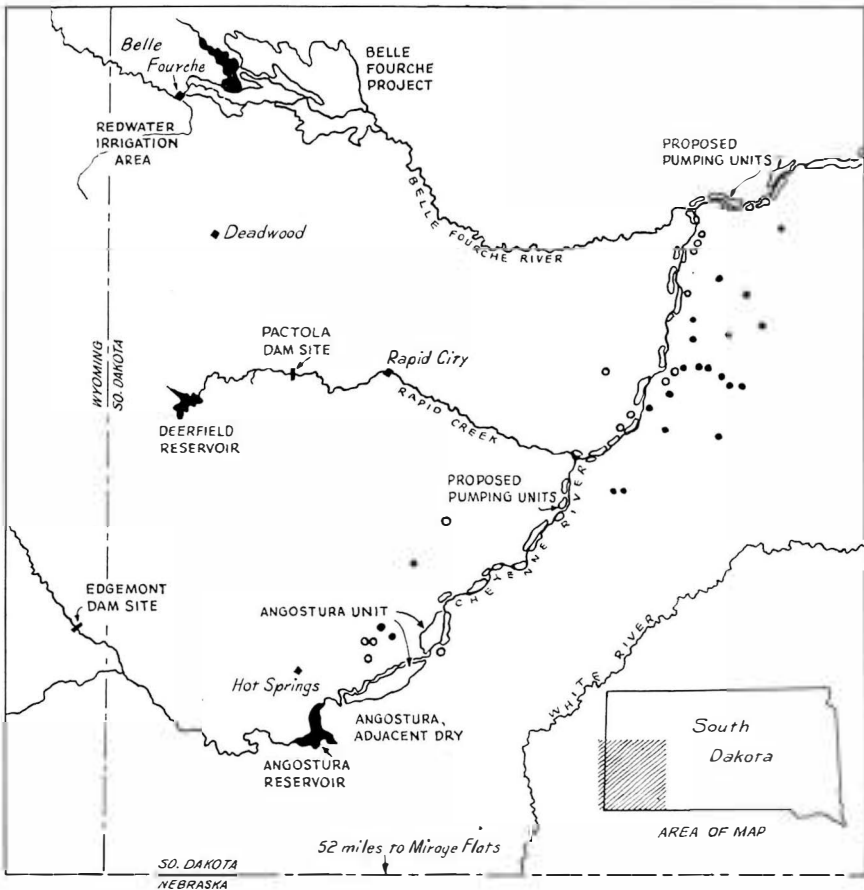


Table 1. Number of Farmers and Ranchers Who Furnished Information for This Study, by Area and Type of Operation, 1951

Area and Type of Operation	Number of Personal Interviews	Number Interviewed in Groups*	Total Interviewed†
<b>Angostura Irrigation Area</b>			
Ranches in proposed irrigation area .....	13	—	13
Ranches adjoining proposed irrigation area .....	14	—	14
<b>Cheyenne Irrigation Area</b>			
Ranches with irrigation or water spreading‡ .....	13	—	13
Adjoining ranches without irrigation or water spreading .....	9	15	24
<b>Mirage Flats Irrigation Area</b>			
Irrigated farms .....	—	38	38
Adjoining dryland ranches .....	—	23	23
<b>Belle Fourche Irrigation Area</b>			
Irrigated farms .....	3	14	17
Adjoining dryland ranches .....	2	16	18
<b>Redwater Irrigation Area</b>			
Ranches with irrigation .....	6	—	6
<b>Total farms and ranches</b> .....	<b>60</b>	<b>106</b>	<b>166</b>

\*With cooperation of Agricultural Veteran Training Classes. The author was present when Belle Fourche schedules were taken. Schedules were discussed with instructors of other classes prior to their use.

†Only operators on a going irrigation project termed irrigation farmers; all others termed ranchers.

‡These schedules were taken in 1950.

combined with farming. Winters are usually fairly open, with live-stock grazing most of the year. Feed crops and native hay provide winter forage. Frequently a protein supplement is supplied with winter range. Some operators have developed private irrigation systems, and extensive water-spreading systems

have been developed in the area. Added moisture supplies are nearly always used in hay production.

Precipitation ranges from 12 to 20 inches over the area with about 18 inches as an average. A major problem of the area is the economic instability which stems from unpredictable moisture supplies.

## Irrigation and the Adjoining Ranch Economy

### Amount of Hay Purchased by Ranchers Adjoining Irrigated Areas

The effects of hay produced on irrigated farms in stabilizing adjoining dryland ranches is related to the amount purchased by the ranchers during droughts and blizzards. Therefore the ranchers interviewed who had neither irrigation nor any significant amount of water-spreading were asked how much hay they had purchased during the previous

3 years. Except for the Angostura area, their replies are summarized in Table 2.

Limitations of these data are apparent. The 3-year period is a short one on which to base an estimate of ranchers' demands for hay, and there were unusually severe blizzards one of the winters of the period (1948-49).

### Cheyenne Area Hay Purchases

Purchases of about 7 tons of hay annually per operator in the Cheyenne area were made for the 3-year

period investigated (Table 2). One operator bought 160 tons for the 1948-49 season or nearly one-third of the 492 ton total. Excluding this operator, average annual purchases for the remaining 23 operators was about 5 tons per year. Fourteen of the 23 operators were agricultural veteran trainees. Their hay purchases were about twice as great as were those of other operators. This indicates that these beginning operators apparently have less feed reserve than do longer-established operators.

#### **Mirage Flats Area Hay Purchases**

Twenty-three operators in the Mirage Flats area reported having bought 485 tons of hay during the 3 years 1948-51 (Table 2). The largest purchase was made in 1948-49, but only four operators reported having bought hay that season. Total hay purchases reported by the 23 operators averaged about 7 tons a year, but only a little more than 10 percent of the total was reported as being irrigated hay.

#### **Belle Fourche Area Hay Purchases**

Information was obtained on hay purchases from 18 operators whose distance from the Belle Fourche Project varied from less than 1 mile to 51 miles. Reported purchases for

1949-50 and 1950-51 totaled 55 tons, with one operator indicating purchases but failing to indicate the amount (Table 2).

#### **Angostura Area Hay Purchases**

Thirteen operators on the Angostura project were interviewed. None reported making annual hay purchases, but several said that they had occasionally bought a little hay to get through a winter. The blizzard winter of 1948-49 was the only time that some ever bought hay. Fourteen operators located within 5 miles of the Angostura Unit were interviewed. Hay was a major crop on some of the ranches, with sales of 50 tons or more being made annually. Two of the operators had dairy herds; they reported making annual purchases in the vicinity. One operator of a beef enterprise reported annual purchases of hay, usually from Midland, South Dakota. For the entire area, although there is some local hay offered for sale annually, it appears that additional supplies are generally required.

#### **Frequency of Hay Purchases**

Ranchers were asked to estimate how often they expect to buy hay. Data in Table 3 do not indicate actual hay purchases but reflect the

Table 2. Hay Purchases by Ranchers in the Cheyenne Area and Areas Adjoining Mirage Flats and Belle Fourche Projects, 1948-51

Area	Number Ranchers Interviewed	Hay Purchased in Tons			Total Purchased 3 Yrs.	Average Annual Purchase Per Rancher
		1948-49	1949-50	1950-51		
Cheyenne, dry* .....	24	245	61	187	492	7
Mirage Flats .....	23	209	128	148	485†	7
Belle Fourche .....	18	‡	35§	20	55	2

\*No irrigation and little or no waterspreading, see Table 1.

†Fifty-six tons of the 485 were reported as being irrigation hay.

‡No information was obtained for 1948-49.

§One operator reported a purchase but did not give the amount.



thinking of operators on how often they expect to buy hay. Estimates are probably based as much on a general knowledge of the area as on experience with a particular unit, many being only beginning operators. It is interesting to note that of the 67 ranchers who replied to the question nearly one-third expect to buy no hay and another one-third expect to buy hay 1 year in 10 or less. About one-sixth expect to buy hay once in 3 to 5 years, and one-sixth expect to buy hay every year.

#### **Summary on Hay Purchases**

The total demand for hay in the Angostura and Cheyenne areas could be characterized as variable, generally light, with some demand every year and occasionally many operators in the market.

Regarding the benefits to ranchers from nearby irrigated hay supplies, past experience with severe storms has shown that surplus hay supplies were of help. However, operators reported that savings in transportation costs were largely offset by a higher price per ton.

#### **Amount of Hay Sold from Irrigation Areas to Dryland Ranches**

Another source of information as to the role irrigation-produced hay

plays in stabilizing dryland ranches was the farmers on the irrigation projects and ranchers who had a significant amount of irrigation or water spreading. Data were secured for only 2 years from selected operators—many of them being beginners in agricultural veteran training classes.

#### **Cheyenne Pumping Unit Hay Sales**

Nearly all irrigation in the Cheyenne area was for alfalfa hay production. Only four of the thirteen operators contacted reported hay sales; in three cases sales were minor; the fourth had ceased livestock production and was offering his landlord's share of the hay for sale. He reported that ranchers offered an uncertain market for hay, generally tried to get along without making any purchases, and that he was thinking of getting into livestock again.

Operators with a supply of hay were able to help some of those who needed feed during the 1948-49 storms. Although ranchers may not sell hay as a usual practice, the record indicates that some hay is supplied to those in need, simply as a neighborly act.

It appears, then, that irrigation on the pumping unit would contri-

Table 3. Estimated Frequency of Hay Purchases by Ranchers

Hay Purchases Frequency	Number Adjacent to				Total
	Angostura Unit	Cheyenne Unit	Belle Fourche	Mirage Flats	
Every year .....	3	2	2	4	11
1 year in 3 .....	2	1	1	2	6
1 year in 5 .....	---	4	1	2	7
1 year in 10 .....	1	2	2	---	5
Under 1 year in 10 .....	4	5	8	1	18
None .....	3	7	3	7	20
No Reply .....	---	3	1	7	11
Total .....	13	24	18	23	78

Table 4. Hay Sales Reported by 38 Farmers, Mirage Flats Irrigation Project, 1950-51

	Number Selling	To Ranchers	To Others*	Total
1949-50 .....	12	129	222	351
1950-51 .....	14	280	137	417
<b>Total .....</b>		<b>409</b>	<b>359</b>	<b>768</b>
Total sales per year (38 units) .....		204.5	179.5	384.0
Average sale per unit .....		5.4	4.7	10.1

\*Includes project farmers, dairy farmers, and purebred livestock breeders.

bute some stabilization to non-irrigators but that the effect would be largely confined to the ranch unit having the irrigation.

#### **Redwater Area Hay Sales**

Six operators on the Redwater River, a tributary of the Belle Fourche River, were interviewed. Their units were essentially ranches with an irrigated feed base—rather similar to present and prospective irrigation developments on the Cheyenne River. Only one of the six reported hay sales. Findings on the Redwater support the conclusion that little hay is likely to be sold from the units combining irrigation with range livestock operations.

#### **Mirage Flats Project Hay Sales**

The Mirage Flats Irrigation Project is located approximately 85 miles south of the Angostura Unit in a ranching area similar to that around the Angostura Unit. The Mirage Flats Project is a recent development with settlement beginning after the war.

For the 2 years reported, hay sales of 38 operators averaged 10 tons per year, but ranchers got only a little over one-half of the hay reported sold, or just over 5 tons per irrigated farm (Table 4).

Few of the 38 operators had been on their units over 4 years. Since

beginning farmers frequently have less livestock than they carry when fully established, sales of hay may be somewhat greater for the period reported than can be expected in the future.

#### **Belle Fourche Project Hay Sales**

The Belle Fourche Irrigation Project is located 125 miles north of the Angostura Unit. Like the latter project, it is located in a range area. Information was obtained from only 17 project farmers. This is a limited sample and is perhaps heavily weighted by the number of beginning farmers. However, this information should help in forecasting hay sales on the Angostura Unit as farmers are getting into operation.

Total hay sales reported for the 1949-50 seasons were 357 tons, with 242 tons reported sold to ranchers. The average sale per unit to ranchers was 14 tons.

Two operators sold 62 percent of all the hay; one reported selling 130 tons, but he indicated that he did not expect to sell any hay a few years hence.

Information on the buying and selling of hay was obtained from 73 project farmers from an earlier study made in 1945 by the South Dakota State College Agricultural Economics Department. Ten re-

ported purchasing hay off the project; three reported hay sales to drylanders. Information is not available on the quantity of hay involved in the transactions. Since only 3 out of 73 sold hay, it appears that hay selling is not done to any extent.

### **Angostura Unit Estimated**

#### **Hay Sales**

Approximately 12,000 acres of irrigated land are now under irrigation or planned for irrigation on the Angostura Unit along the Cheyenne River in southwestern South Dakota. The unit is about 30 miles long and has a maximum width of 3 miles. The livestock industry is of major importance in the area. All but 1 of the 13 operators interviewed were engaged in livestock production. These operators indicated they planned to use irrigation to provide forage for their own needs. In addition to grazing land owned or leased by resident operators, grazing permits for 528 animal units were held by 14 operators who will have some irrigated acreage in the unit. Hence, it is evident that many units will afford the opportunity to use irrigation as a feed base.

#### **Estimated Stabilization Effect of Angostura Unit**

#### **Wintering Range Livestock**

An estimate of the acreage that will be stabilized by irrigation on the Angostura Unit can be made if certain assumptions are accepted. If each of the 67 new operators on this project sells 5 tons of hay a year to adjoining ranches, as did the new operators on the Mirage Flats project (Table 4), then this would provide enough hay at three-

fourths of a ton per cow to winter 445 cows. Since additional summer pasture of 20 acres a cow are required, 9,000 acres would be "stabilized" since a more dependable source of winter feed would be available at the end of the pasture season. The remaining hay fed on these irrigated farms would stabilize another 10,000 acres in the same manner.

The evidence suggests that the 47 operators already established in the area, who get some irrigated land for a feed base or other crops, are likely to feed all the hay to their own livestock and, hence, the land in these farms would be stabilized. This amounts to about 58,000 acres since the average size of farms in the 10 minor civil divisions in the Angostura area is 1,225 acres. Moreover, 14 of these established operators hold grazing permits for a total of 538 cows. Allowing 20 acres a cow, an additional 11,000 acres would be stabilized by this means. Thus, the total acres stabilized by the Angostura Irrigation Unit would be about 88,000 acres as can be seen in the following summary:

67 new irrigation farms (acres)	
From sale of hay to others .....	9,000
From hay fed on farm .....	10,000
47 established ranches receiving some irrigated land (acres)	
From sale of hay to others .....	none
From hay fed on ranch .....	58,000
From grazing permit land .....	11,000
Total acres stabilized .....	88,000

The area stabilized under these assumptions would be equivalent to 70 dryland farms of 1,200 acres each—the average size for the area. More liberal assumptions as to hay sold and acres stabilized would of

course lead to different conclusions, but the evidence suggests that the assumptions used are realistic.

#### **Feeding in a Drought Period**

In examining the stabilization effect of irrigation, attention has been given mainly to the part that hay supplies would play in wintering livestock.

It has been pointed out that the Cheyenne area is subject to droughts. Just how much liquidation of breeding herds irrigation would prevent on the Angostura Unit is problematical. In times of severe droughts, roughage would be needed the year around, for in such a situation dryland hay production would be limited, and there would not be much straw, fodder, or other feed available. Under such drought conditions, at least 2 tons of hay per year would be necessary for each cow, or about 60 percent of standard requirements.

How much hay will be available for sale off the Angostura Unit in the event of drought? According to the analysis provided in this report, approximately 670 tons of hay per year would normally be sold off the Angostura Unit. To what extent irrigation farmers might offer additional hay for sale in the event of drought is a moot question. But if ranchers got all of the 670 tons of irrigated hay, and if this hay were fed at the rate of 2 tons per cow, it would provide for 335 cows. With a range requirement of 20 acres per cow, stabilization would be effected on about 6,700 acres. Therefore purchased hay would affect a somewhat smaller acreage in time of drought than normally.

With hay production on the Angostura Unit at 10,750 tons annually<sup>3</sup> and sales at 670 tons, about 6 percent of the hay would be sold. This estimate may seem very low; the Bureau of Reclamation estimate was higher. However, Ward and Kelso<sup>4</sup> indicated that hay sales from the Malta Division of the Milk River Project in Montana were probably under 10 percent for the 1946-47 feeding season. They found about 71 percent of the 25,000 irrigated acres of cropland on the Malta Division was in hay. A yield of 2 tons per acre<sup>5</sup> then, would result in the production of 35,000 tons of hay. They estimated that 2,000 to 3,000 tons of hay moved from the Malta Division to adjoining areas during the winter of 1946-47. Hence 6 to 9 percent of the hay produced on the area was moved to the adjacent area during this period.

Regarding the question of the stabilizing influence of integration, Ward and Kelso report as follows:

The strategic value of surplus feed in stabilizing livestock production in the vicinity of irrigation projects during spotty or mild droughts may be more important than the effect during severe or widespread droughts . . .

As most farmers on the irrigation projects prefer to control grazing land and to own enough livestock to consume all food produced, it is questionable whether surplus feed would be available to winter addi-

<sup>3</sup>Assumes 35 percent of irrigable acreage in alfalfa and an average yield of 2.5 tons per acre (from Bureau of Reclamation budgets).

<sup>4</sup>Ralph M. Ward and M. M. Kelso, *Irrigation Farmers Reach Out Into the Dryland*, Montana Agricultural Experiment Station Bulletin 464, Bozeman, September 1949.

<sup>5</sup>1930-45 yield on the Milk River Project from *Trends in Land Use and Crop Production*, 12 Federal Reclamation Projects, Northern Great Plains, BAE cooperating with the Bureau of Reclamation and South Dakota State College, Washington, D. C., November 1947.

tional livestock from range during years of general drought. Probably from 2,000 to 3,000 tons of hay were moved from the Malta Division to adjoining areas during the winter of 1946-47. This prevented the liquidation of livestock in the limited area, but would have been inadequate if a widespread drought had prevailed. If fed to livestock at the rate of one-fourth ton per head as a supplementary supply, the surplus hay would reach about 10 percent of the livestock in Philips County where the Malta Division is located.

The Montana study supports the conclusion that adjoining drylanders purchase only a small percentage of the hay produced on an irrigation project. It would have a very limited effect in time of widespread drought.

Ranchers in the study area generally said if they could not find pasture they would cut livestock numbers and that they would not maintain a herd if practically the sole recourse were buying hay.

#### **Stabilization from Cheyenne Pumping Unit**

The amount of irrigation expected in the Cheyenne Pumping Unit is not yet known and therefore no estimate of the extent of stabilization in connection with the unit is offered here.

Information from irrigation operators in the area and from comparable units on the Redwater suggests that no significant amount of hay would be sold. It appears probable that any stabilization provided will be confined primarily to the unit containing the irrigation.

#### **Measuring Stabilization Benefits**

As a means of measuring the benefits of stabilization to ranch

operators, the possibility of budgeting the operation "with" and "without" the project was considered. Any advantage to a ranch operator through the purchase of irrigated hay would depend on increased accessibility to hay supplies, especially in times of winter storms and/or a lower price per ton for hay purchased.

The value of irrigated hay would be reflected as a direct benefit in the budget of the producer's operations. The price of hay sold from the unit might very well reflect, at least in part, the unusual demand of ranchers for hay. If feed supplies were sold to a rancher would they have some value in excess of what has been taken as market price? The stabilization benefit, if any, would be the increased value over what the hay was worth to the irrigator either for feed or for sale. That there may be such an increase is possible; that the increase would be significant is improbable.

Because of the many questions respecting the amount of irrigated hay that adjacent operators may obtain under various conditions, any estimate of the effect of such feed supplies on the market can hardly be very reliable, and consequently there appears to be no sound basis for a budget analysis.

#### **Changes in Land Value**

One possibility of measuring stabilization benefits is to observe changes in land value. Added stabilization of a livestock range economy implies a more dependable income and a higher average income. This effect should be reflected in higher land values. It would seem,

too, that better access to such things as service centers, schools, and electrical power, which could result from the development of an irrigation project, might be reflected in higher land values. Theoretically, land values would reflect the incidence of both the monetary and nonmonetary income effects.

#### ***Using Judgment of People in Area***

There may be a solution other than the incorporation of stabilization effects in the benefit-cost ratio.

It should be helpful to show the findings on stabilization, including an estimate of the number of acres affected, to those operators whom it appears will benefit by a development. This group would decide what interest they have in the proposed development and what they can afford to pay. The judgment of such operators should be of value in the evaluation process, and it would have the desirable feature of providing the basis for broadened financial support for projects.

## **Other Integration Effects of Irrigation**

### **Additional Alternatives for Enterprise Organization**

Thus far only the stabilization which might result from the sale of irrigation-produced hay to adjoining dryland ranchers has been considered. However, irrigation projects provide an opportunity for other transactions between irrigation farmers and adjoining dryland ranchers which may be mutually beneficial. The opportunities to take in livestock for pasture, to have livestock fattened or a breeding herd maintained on an irrigation farm, or have a better market for livestock and feed are examples.

These transactions give the rancher added alternatives for organizing his operations. An additional demand is created for his grazing lands. He has the possibility of obtaining feed from another source for his livestock operation. This might enable him to carry more livestock. An additional mar-

ket outlet for feeder stock would become available. Conversely, the irrigation farmer, as a result of his location, may hire pasture, dispose of surplus feed, and purchase feeders more advantageously than would be possible were he more distant from dryland operators.

Ranchers adjoining irrigation projects generally reported no gains or anticipated no gains in their livestock operations from being in proximity to an irrigation development.

Irrigation farmers generally believed that integration transactions held a possibility of gain for them. Nearly 20 percent of the Mirage Flats irrigation farmers questioned had leased range every year; others on the project had sometimes leased range. Little feeding on a gain basis was reported.

Information on the extent to which Belle Fourche Project farmers have integrated their operations

with the adjacent area is available from a 1945 report:

Nearly one-third of the operators on Belle Fourche Project bought feeder lambs. These lambs were nearly all purchased within 75 miles of the project. Relatively few operators on the Belle Fourche Project bought feeder cattle off the project, and those purchased were bought locally.<sup>6</sup>

In the same study it was found that of 73 Belle Fourche farmers who were interviewed, 38 hired pasture for an average of 25 animal units of livestock for the 1945 season.

From the 1945 findings on Belle Fourche, one might judge that there was appreciable combination of range with irrigated units. Since 1945 much of the range on which stock was taken in for pasture has been sold to a relatively few large operators. It is no longer available for leasing, and the consequence is that fewer irrigation farmers are able to lease pasture than was the case in 1945.

The experience on Belle Fourche supports the argument that irrigation farmers will utilize range when it is available but that only those operators who own or control range have much assurance of being able to combine their units in this manner. This investigation of combination transactions revealed that some were taking place but that, for the most part, irrigation farmers and drylanders tended to operate independently of each other.

#### How Much Hay Can Profitably be Fed to Beef Cows?

With added hay supplies in an area, ranchers might feed hay more generously to their breeding herds than formerly. What are the chances that such feeding would be profitable to ranchers? Present information does not support the

<sup>6</sup>*Class and Size of Farm, Tenure, and Income, 1945, Belle Fourche Irrigation Project, South Dakota and the Lower Yellowstone Irrigation Project, Montana and North Dakota, Bureau of Agricultural Economics in cooperation with the Bureau of Reclamation, Washington, D. C., October 1947.*

Figure 2. Dams such as this provide stabilization benefits mostly to the rancher who has land that can be irrigated by water from the reservoir.



thesis that liberal feeding of hay to range cows will result in increased profits to ranchers.

An Experiment Station study showed that during the winters of 1941 to 1946, any supplement fed to cows increased the weaning weights of calves the following fall. The ones receiving wheatgrass hay and the ones receiving the cottonseed cake produced the heaviest and fattest calves. However the differences were not great enough to be significant when tested statistically.

Since the gains made were not statistically significant there is nothing

to indicate that such feeding would be profitable.

Feeding good hay at calving time may be of special value. In 1950 the spring was late, and from interviews it was learned that ranchers experienced higher than usual death losses among calves that year. It is possible that not only a lack of feed but the quality of feed was an influential factor in the losses. For example, it is known that the vitamin A, or carotene, content of milk is related to forage quality as measured by brightness or greenness of hay. A deficiency would adversely affect calves.

## Opinions on Combining Dry and Irrigated Land

About 85 percent of responding ranch operators expressed a belief that it is desirable to have an irrigated feed base to combine with rangeland. About two-thirds of these operators believed that the location of an irrigation project near them would be desirable, but generally they did not expect economic benefits in their livestock operations from adjoining irrigation developments.

Irrigation farmers almost without exception expressed a desire for dryland to combine with their irrigated unit. Usually operators were interested in enlarging their livestock enterprise and some specifically mentioned the desire for greater diversification. Some rather typical comments are quoted from seven Mirage Flats irrigation farmers who termed their units too small:

"I think the extra room or range is worth a lot, during certain seasons

of the year. . ."

"I believe a quarter section or more pasture is as important as the unit itself. It will give summer feed for cattle, building site for your irrigated land, also a place for a little summer fallow for wheat, a good cash crop."

"Not enough land in the unit to farm or to use as pasture."

"The units on Mirage Flats are too small to realize enough profit in a good year to carry you over the bad ones—a little more land might help a lot."

"A place to summer stock; cheap land to dig trench silos on. Can use all your irrigated land to grow crops on."

"Irrigated units are not large enough to plant a very large pasture. Dryland would give you a chance to have more pasture and a more sensible type of farming."

"It would be desirable (to have dryland). The main reason is that my farm of 100 acres is not enough acres to raise enough grain and roughage and still have cash crops."

"Give me a quarter section dryland



with my 102 acres irrigated and I think that I'll have a good set-up." "Yes, a place to run your stock and still have enough irrigated land for farming."

These statements indicate a desire for a larger unit. Although many operators did not spell out their needs so specifically, their desire for pasture or feed crops makes it clear that they want a larger unit made up of dry and irrigated land. Operators are generally interested in enlarging their businesses and would like to keep more livestock. Almost without exception the operators expressed a desire for dryland.

Farmers on Angostura will control more dryland than is generally the case on Federal projects, but the units will not be large enough for a beef enterprise. The typical Angostura unit, having about a quarter-section of dryland, will lend itself to only slightly more extensive operations than would an exclusively irrigated unit. Inasmuch

as the rangelands of an area are generally closely controlled, it would probably take long-range planning to set up units combining irrigation and range. Whether or not combined units should be set up should be determined by the people immediately concerned, and assisted by state and Federal action to deal with the public interest in such developments.

On the Belle Fourche Project some operators have acquired grazing lands and use their irrigated land largely for forage production. In the Oahe Irrigation Area of central South Dakota combination of dry and irrigated land appears to be economically desirable according to a recent study by Helfinstine.<sup>8</sup> The next step is to explore the possibilities of providing such units and, further, to explore possibilities for equitably apportioning the costs among the beneficiaries of such developments.

## Summary and Conclusions

The purpose of this study was to determine the probable extent of stabilization of dryland ranching operations in western South Dakota that would result from the development of an irrigation project in the area.

The impending irrigation developments selected for study were the Angostura Irrigation Unit and the Cheyenne Pumping Unit area immediately downstream on the Cheyenne River from Angostura. In addition to gathering data in the study area, the experiences of oper-

ators on nearby irrigation projects and of operators adjoining these projects were examined. Information was obtained from 166 farmers and ranchers for the years 1948-49, 1949-50, and 1950-51.

Although there are many ramifications to this question of stabilization effects of irrigation to adjoining non irrigators, research was concentrated on determining the extent to which ranchers depended on the purchase of hay in their livestock

<sup>8</sup>Rex D. Helfinstine, *Economic Potentials of Irrigated and Dryland Farms in Central South Dakota*, South Dakota Experiment Station Bulletin 444, 1955.

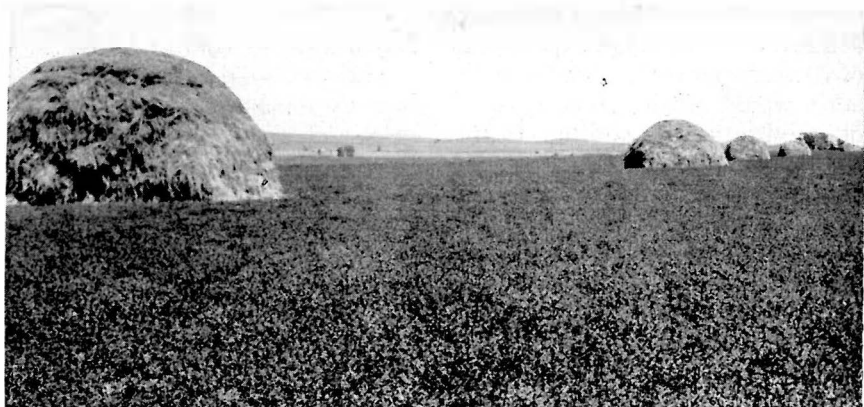


Figure 3. Ranchers with irrigated land can stabilize their livestock production.

operations and on estimating the amount of hay that irrigation farmers would offer for sale under varying conditions.

#### **Demand for Hay and Prospective Supply from Angostura Unit Hay Purchases**

Ranchers in western South Dakota appear to buy little hay. Hay purchases by 24 ranchers in the Cheyenne area and by 23 ranchers adjoining the Mirage Flats Project averaged only 7 tons annually per operator for the three winters, 1948-50. About one-half of the total hay purchases were made during the severe winter of 1948-49. Also about 80 percent of the operators were agricultural veteran trainees, generally beginning operators who might need additional hay. Thus the 7 tons of hay purchased per operator may be well above a long-time average.

Ranchers indicated that they expected to buy little hay in the future. Of the 67 ranchers who replied to a question concerning future hay purchases about one-third expected to buy no hay, about one-third ex-

pected to buy hay 1 year in 10 or less, about one-sixth expected to buy hay once in 3 to 5 years, and about one-sixth expected to buy hay every year.

#### ***Sales of Hay from Irrigated Land***

Based on the experience of comparable Mirage Flats irrigation units, it is estimated that each of the 67 new irrigation farms on the Angostura Unit will sell about 10 tons of hay per year. Normally about one-half of this hay would be purchased by adjacent ranchers. The assumption has been made that present dryland operators in the area who receive water will utilize their irrigated acreage in their own livestock operations and that they would not offer hay for sale. Hence, total hay sales are estimated to be only 670 tons per year.

#### **Extent of Stabilization**

If ranchers bought one-half the total hay sold from the Angostura Unit they would obtain 335 tons annually. Based on a requirement of three-quarters of a ton of hay per animal unit, this would provide

supplemental hay for approximately 450 cows. With a range requirement of 20 acres per cow, a total of 9,000 acres would receive some measure of stabilization. In addition to this stabilization, it is estimated that new operators on the Angostura Unit will own an estimated 10,000 acres of dryland which will be combined with their units and thus stabilized.

A greater stabilization effect is expected from the combination of irrigation with established livestock production. Approximately 47 Angostura operators will have units combining irrigation with range-land owned, leased, or utilized through grazing associations. Assuming that units average 1,225 acres in size, about 58,000 acres would receive stabilization effects. Grazing district land utilized by operators with irrigation will add another 11,000 acres to the total. In all, an estimated 88,000 acres of adjoining dryland would receive some stabilization effect from irrigation on the Angostura Unit. This is equivalent to 70 dryland farms of 1,200 acres each.

If during a drought hay sales from the Angostura Unit continued at the rate of 670 tons per year and ranchers fed all of this hay at the rate of 2 tons of hay per animal unit the 670 tons would maintain 335 cows. With a grazing requirement of 20 acres per cow, approximately 6,700 acres of range would receive some stabilization benefits from the hay sold. Additional benefits would be secured from combining dry and irrigated land but these were not estimated.

### **Value of Stabilization**

#### ***Importance of Irrigated Hay***

The economic value of irrigated hay to ranchers depends on the price and accessibility. A savings on the price of hay will result only if supplies are increased relative to the demand for them. Total hay production on the Angostura Unit has been estimated at about 10,700 tons per year. The average hay production for five western South Dakota counties, 1929-48, was 195,000 tons per year. So the total projected hay production of the Angostura Unit is very small as compared to the five-county total. This study indicates that about 6 percent of the hay from irrigated land will be sold. Even this figure may decline as new Angostura operators become better established.

During the blizzard winter of 1948-49, operators with surplus hay were able to help some of those who were in distress. Experience has demonstrated that hay can be shipped in from well out of a storm area. All hay, assuming no quality differentials, would command the same price in the local market. Thus any savings to a rancher would come about as a consequence of an increase in the supply of hay relative to the demand for it. The possibility of dryland ranchers having either a cheaper or a more dependable source of hay as a result of an adjoining irrigation development is not promising.

#### ***Dollar Value of Stabilization***

This study failed to provide a means of measuring the dollar benefits of stabilization to drylanders. However, two possibilities for the

evaluation of such benefits were offered: (1) a careful study of changes in land values in the area adjoining an irrigation development and (2) utilization of the judgment of adjoining operators as a means of determining what a prospective development is worth to him. By showing such operators an estimate of the amount of hay that would be offered for sale from an irrigation project, for example, these operators would have an improved basis for deciding what value a prospective irrigation development would have to them.

### **Combined Units**

The combination of dryland and irrigated land into single ranch units appears to have much greater promise in affording stabilization than does the sale of irrigated hay. Both ranchers and irrigation farmers expressed a desire for this type of unit. About 85 percent of responding ranch operators expressed the belief that it was desirable to have an irrigated feed base to combine with rangeland, and irrigation farmers, almost without exception, expressed a desire for dryland to combine with their irrigated unit.