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# Bulletin No. 230 - San Juan County Experimental Farm: Progress Report, 1925-30, Inclusive

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JAMES H. EAGAR AND A. F. BRACKEN

Field of beans on farm of G. R. Hurst near Blanding, San Juan County.

**Utah Agricultural Experiment Station**

**Utah State Agricultural College**

LOGAN, UTAH

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# San Juan County Experimental Farm[1]

## Progress Report, 1925-30, Inclusive

JAMES H. EAGAR AND A. F. BRACKEN[2]

### LOCATION AND NATIVE VEGETATION

San Juan County, located in the southeast corner of the state, has a dry-farm area of approximately 600,000 acres extending from Monticello 26 miles south to Blanding and 6 miles north to Peter's Hill and stretching from the Blue Mountains east 30 miles to the Colorado line. One-fourth to one-third of this area is covered with timber consisting mainly of pinion pine, oak brush, and juniper commonly called cedar. Both the juniper and pinion are of value as fuel and building material, and the juniper has an additional value for fence posts. While small areas have been cleared of timber for farm purposes with favorable results in respect to yield of crops, most of the tillable land was or is now in sagebrush. The sagebrush consists of two types: the common type (*Artemesia tridentata*) and a dwarf brush, compact, and dark in color. The latter type is found growing usually on the poorer soils, shallow in depth, and of a heavy, clayey type. Blue-stem wheat grass, another native plant of this area commonly found growing in association with sagebrush, is of economic value in that it serves as summer pasturage for stock.

### ELEVATION

The elevation of the dry-farm area of San Juan County varies between 6000 to 7200 feet, with a majority of land having a height above sea-level of approximately 6300 feet.

### TOPOGRAPHY

The land is rolling with the low and high elevations extending in a north to south direction. Here and there deep, rugged box canyons cut through the section, serving as a drainage system in carrying the runoff water mostly into the San Juan River, a tributary of the Colorado.

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[1]Contribution from Department of Agronomy, Utah Agricultural Experiment Station. Progress report of Station Project 100—San Juan County Experimental Dry-farm. Established in 1925.

[2]Superintendents of San Juan County Experimental Dry-farm and Nephi Dry-farm Stations, respectively.

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**Fig. 1.**—Scene typical of a large part of the non-farming area of San Juan County.

## SOIL

The soils of the dry-farm area in San Juan County vary greatly in depth and texture and consequently show rather marked differences in yields of crops. In some spots the rock outcrops at the surface; in other places the soil is several feet in depth. For successful crop-growing the soil needs to be at least 6 feet deep to permit of moisture storage. In texture the soils vary from fine sandy loams to light-colored heavy clays. The darker, medium clay loams are best for cropping purposes. In general, the soils have been weathered from the underlying shaley rock material, with the exception of the lower elevations where the soil material has been transported and deposited by surface runoff of water.

## CLIMATE

**Temperature:**—The meager records available indicate that frost has occurred every month of the year in this county. The usual frost-free period, however, is approximately 100 days. During the latter part of April and the first part of May, the temperature is usually warm, resulting in a thrifty crop growth. From May 25th to about June 10th and even as late as June 20th frost usually occurs, and occasionally the temperature falls so low as to seriously damage alfalfa, corn, beans, and other tender plants. As a rule, this occurs in the low, poorly-drained areas. The most serious damage has been observed in the north half of the dry-farm area. In the south half, including Blanding, the growing period is significantly longer. Summer days in San Juan County are extremely mild and pleasant

and nights are cool and refreshing. Winters are not exceptionally cold, the temperature seldom falling below zero.

**Precipitation.**—The rainfall of San Juan County is probably greater than that of any area of tillable land of equal size in the state. Data extending over a long period are lacking; but judging from the statistics available, the average annual precipitation is practically 17 inches, as indicated by Table 1 which gives an average measurement of 16.68 inches over the 3-year period from 1928 to 1930, inclusive. An examination of these results indicates a range in total annual precipitation from 19.31 inches for 1928 to 13.94 for 1929.

TABLE 1.—PRECIPITATION MESAUREMENTS AT MONTICELLO, SAN JUAN COUNTY, FROM 1928 TO 1930, INCLUSIVE

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1928 | 0.32 | 1.70 | 2.29 | 1.10 | 1.45 | 0.78 | 1.06 | 2.34 | 0.09 | 4.25 | 2.72 | 1.21 | 19.31 |
| 1929 | 1.84 | 1.04 | 0.19 | 0.97 | 0.82 | 0.28 | 2.52 | 2.93 | 2.89 | 0.16 | 0.18 | 0.12 | 13.94 |
| 1930 | 4.35 | 0.64 | 0.48 | 0.91 | 0.69 | 0.35 | 2.36 | 2.11 | 1.49 | 0.92 | 2.76 | T | 17.06 |
| 3-year average | 2.17 | 1.13 | 0.99 | 0.99 | 0.99 | 0.47 | 1.98 | 2.46 | 1.39 | 1.78 | 1.89 | 0.44 | 16.68 |

The individual months show considerable variation in precipitation with the exception of July and August, both of which are consistently rather high. The January average of 2.17 inches follows August but with a variation from 0.32 inch for 1928 to 4.35 inches for 1930. October, another month of comparatively high precipitation, shows a variability between 0.16 inch in 1929 to 4.25 inches in 1928. The period of low precipation extends from March to June, inclusive. This scant spring and early summer rainfall followed by a period of high late-summer precipitation presents a difficult problem for the cultivator. In some seasons early seeding of crops gives the best results, while in others June sowing produces the highest yields. The precipitation records, given in Table 1, were taken at Monticello on the eastern slope of the Blue Mountains. Probably the rainfall here is somewhat higher than farther east due to the effect of the mountains.

## SAN JUAN COUNTY PROBLEMS

From Monticello to Thompsons, the nearest standard gauge railroad station, the distance is 102 miles; from Monticello, to Durango, Colorado, the nearest railroad point but on a narrow gauge track, the distance is approximately 60 miles. In addition to tillage and cropping problems, the isolation of this section from a shipping point precludes any possibility of growing wheat, oats, barley, corn, or any other crops of rather a bulky nature beyond local requirements except in years of relatively high prices. Such crops need to be fed locally and the concentrated product in the form of hogs, poultry, sheep, or cattle shipped out. If crops are grown for outside markets of necessity they must have a high value in proportion to

the bulk. There is a great need in San Juan County for such crops. Road improvement, however, in the last few years has been of great importance to the agricultural development of this area. In 1925 cost of shipping from Monticello to Thompsons was approximately 85 cents a hundred. Because of the great improvement in roads which now permits the use of large trucks, the cost of hauling varies from 40 to 60 cents per 100 pounds of freight. And now with the development of new improved highways both east and south, the opening of additional markets and shipping points will be of great significance to the advancement of agriculture in this region.

## ESTABLISHMENT OF STATION

Because of the many problems involved in the development of a permanent agriculture for San Juan County, in 1925 the State Legislature made a special appropriation for the establishment of an experimental farm for the purpose of determining the possibilities of alfalfa-seed growing. Accordingly, a 40-acre tract was selected by officials of the Utah Agricultural Experiment Station cooperating with local citizens. The location chosen was 10.5 miles east of Monticello on what was known as the Garretson Farm. Work was begun in the spring of 1925; winter cereals and alfalfa were seeded in September followed in the spring of 1926 by spring crops. The first results were secured in 1926. In addition to alfalfa-seed growing, other projects were included in the experimental procedure of the station such as varietal trials with winter and spring wheat, spring oats, and barley; yield tests of root crops including carrots, half sugar-beets, and mangels; testing of forage crops such as corn varieties, sorghum varieties, sweet clover, rye, and grasses; and in addition, determining possibilities of crop rotation practices. The data of these different trials are reported in this publication.

As far as uniform experimental results are concerned the location of the substation on the Garretson Farm was rather unfavorable because of soil variations and climatic extremes. A shallow, shaley, gravelly soil extending from north to south through the center of the field as well as on the southwest corner proved to be a source of difficulty in securing uniform data as compared to deeper soil on slightly lower elevations on either side. In addition, almost yearly frost damage to all tender crops such as beans, corn, sorghum, potatoes, and alfalfa seriously interfered with getting positive experimental data. While the accumulated results of this 40-acre tract are of decided value in offering advice to local farmers on crop planning, yet it seemed advisable both by Station authorities and a number of San Juan County citizens to relocate the substation in an area where soil and climatic conditions were known to be more favorable to crop growing. This change was made early in the spring of 1931. The site chosen was the William King Farm, which is approximately 6 miles south of the former location.[3]

To extend the usefulness of the experimental results of the farm and to broaden the scope of the service which the Utah Agricultural Experiment Station might render, cooperative tests with individual farmers were included as an experimental project in 1930.

[3]The new station is located 8 miles east and 6 miles south of Monticello near the center of the dry-farm area.

## ALFALFA SEED

According to legislative action, the primary purpose in the establishment of the San Juan County Experimental Farm was to determine the possibilities of alfalfa-seed growing with a hope that this crop of relatively high value to a unit of bulk might prove of economic value. Approximately two-thirds of the original 40-acre farm, therefore, was seeded to alfalfa. In this experiment were included various row and hill widths, different rates of seeding, cultivation tests, varietal trials, and clipping tests. Each test was replicated twice on tenth-acre plats 121 by 36 feet, with 5-foot alleyways between plat and roadways at each end 14 feet wide.

As far as seed production is concerned, the results of this experiment have been disappointing. In 1926, the first year of sowing, the plants were not old enough to form seed. During the following season (1927) a good growth of forage developed but no seed formed possibly because of excessive rain which continued so late as to prevent obtaining weights of the alfalfa for forage yields. In 1928 no seed formed although forage yields were secured. In 1929 the entire field was blue with bloom and many pods developed, but at threshing time after a few trials it was found that seed yields were too low to justify continued threshing. The year 1930 was a repetition of the previous seasons and no seed formed. While this experience with alfalfa for seed is not conclusive evidence that seed cannot be grown in San Juan County, it does rather significantly indicate that the chances are remote that such a crop will ever become important in the large dry-farm area east of Monticello.

TABLE 2.—FORAGE YIELDS OF ALFALFA VARIETIES AND ALFALFA SEEDED IN ROWS OF VARIOUS WIDTHS AND IN HILLS AT DIFFERENT DISTANCES APART

| | 1928 | 1930 | 2-yr. Avg. (lbs.) |
|---|---|---|---|
| In drills 7 inches apart (ordinary drilling) | 934 | 1952 | 1443 |
| In rows 28 inches apart | 1337 | 1715 | 1526 |
| In rows 42 inches apart | 1482 | 1692 | 1587 |
| **Alfalfa in Hills** | | | |
| In rows 7 inches apart (ordinary drilling) | 1470 | 1490 | 1480 |
| In rows 28 inches apart and hills 21 inches apart | 2100 | 3270 | 2685 |
| In hills 28 inches apart and hills 28 inches apart | 1680 | 3130 | 2405 |
| In hills 28 inches apart and hills 35 inches apart | 1470 | 3130 | 2300 |
| In hills 28 inches apart and hills 42 inches apart | 1700 | 1110 | 1405 |
| **Varieties of Alfalfa** | | | |
| Common | 1800 | 2230 | 2015 |
| Grimm | 2790 | 3270 | 3530 |
| Cossack | 1740 | 3380 | 2560 |
| Hardigan | 1700 | 3305 | 2502 |

In two of the four seasons when the substation was in operation on the original site, forage yields were obtained from alfalfa-seed plats after it was evident that no seed would be produced. These data are given in Table 2. Yields given in the first part of the table represent averages from several plats, while yields of alfalfa in hills and varieties are averages from two replications. The high 1930 yields of Grimm, Cossack, and

Hardigan were due to flood waters running over these plats; the high yields of alfalfa in hills for the same year can probably be attributed to this cause also. These data indicate that seeding alfalfa in rows 28 inches apart or in hills gave higher yields than ordinary drilling with rows 7 inches apart. In the varietal trials Grimm showed a significant advantage in yield over the others, especially in 1928, which is considered normal in respect to precipitation. While these yields are not high as compared to production in irrigated areas, yet when it is considered that alfalfa needs to be seeded only once in several years with little, if any, expense attached to the growing of the crop except for harvesting and since alfalfa is of such high value both for forage and for pasture, it can be considered a profitable crop to grow on the low-valued dry-land in San Juan County to be used either for forage or pasture purposes.

## FORAGE AND ROOT CROPS

Because of the distance to shipping points, it is probable that successful farming in San Juan County will always be connected with some sort of livestock production. Feed crops, therefore, necessarily should be given consideration in any experimental project planned to aid the farmers of the section to a proper solution of the crop problems.

In the five years during which this substation has been in operation yields of various forages have been obtained. The data are given in Table 3.

TABLE 3.—ANNUAL AND AVERAGE YIELDS OF VARIOUS FORAGE AND ROOT CROPS OVER THE FIVE-YEAR PERIOD FROM 1926 TO 1930, INCLUSIVE

| Crops | Annual and Average Yields per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| Corn | | | | | | |
| Minnesota No. 13, lbs. | 1500 | 6,010 | 2,600 | 8,650 | 2,690 | 4,290 |
| Australian White Flint, lbs. | 1340 | 10,310 | 2,400 | 10,910 | 2,530 | 5,498 |
| Peas | | | | | | |
| Canadian Field | | | | | | |
| Fodder, lbs. | .... | 2,440 | * | 2,651 | 2,450 | 2,514 |
| Seed, bus. | .... | 16.2 | .... | 19.0 | 16.3 | 17.2 |
| Fodder, lbs. | .... | 2,955 | 921 | 3,107 | 2,430 | 2,353 |
| Seed, bus. | .... | 21.1 | 6.1 | 22.6 | 16.1 | 16.5 |
| Sorghum | | | | | | |
| Early Amber | | | | | | |
| Fodder, lbs. | .... | 3,500 | 2,900 | 1,450 | 1,340 | 2,298 |
| Root Crops | | | | | | |
| Beets—Half sugar, tons | .... | 6.1 | ** | 2.6 | ** | 4.4 |
| Improved Mangels, tons | .... | 10.05 | ** | 4.4 | ** | 7.22 |
| Stock carrots, tons | .... | 12.08 | 8.12 | 4.07 | ** | 8.09 |
| Sweet Clover, lbs. | † | 3,300 | † | 2,020 | † | 2,660 |
| Brome Grass, lbs. | † | 1,260†† | 630 | 460†† | 810 | 790 |

* Not seeded.
** No crop, poor stand.
† Seeded.
†† Single plat.

As indicated by the yields of corn in Table 3, this crop offers considerable promise. The yields represent fodder weights on a field-dry basis. When it is considered that this equals only 20 to 30 per cent of its green weight,

corn for silage likely needs to be given some attention. Of the two varieties grown, Australian White Flint has produced the higher yields. This variety has an added advantage in maturing earlier than Minnesota No. 13.

Early Amber sorghum has given an average acre-yield of 2298 pounds of fodder. While this is only half the yield of the lowest yielding corn variety, sorghum does have a standing of importance as a forage.

Peas as a forage crop have not been tried by the farmers of San Juan County, but the yields as given in Table 3 indicate that this crop has a decided value either as a feed crop or as a seed crop. The greatest value of peas probably can be secured from using the crop by pasturing with hogs or with sheep. From the experience of farmers in other sections, these animals do harvesting in a most profitable and satisfactory manner.

Various root crops have been grown for some time by a few farmers in San Juan County. Root crops serve an important purpose in supplementing the dry forages. Individual plat yields have been recorded as high as 17 tons to an acre for mangels and 15 tons for carrots. However, average yields, as given in Table 3, were lower than this. Getting a good stand is the main difficulty connected with growing root crops, as indicated by the results. Soil preparation for such crops should begin by fall plowing, followed by sufficient spring tillage to prepare a fine, firm seedbed.

Because sweet clover is a biennial with little plant growth produced the first season after seeding, only three years' results have been recorded. These yields indicate that sweet clover has promise as a forage or pasture crop.

While the yields of brome grass, as given in Table 3, are too low for profit as a hay crop, yet the crop does have promise for pasturage. Once seeded, brome grass will last for several years, producing a rather short, heavy mat of good forage under San Juan County conditions.

## WINTER WHEATS

With nearer railroad shipping points, wheat would become an important crop for San Juan County; but because of the long truck haul transportation charges preclude any possibility of extended wheat-growing beyond home consumption requirements, except in years of general high prices. The winter wheat varietal trials, as given in Table 4, show Turkey 926, a pureline developed at the Nephi Station, to stand first, followed by Black Hull and then by Sevier and by Kanred. The soil on which this set of plats was located is uniform, however, as indicated by the wide varia-

TABLE 4.—ANNUAL AND AVERAGE YIELDS OF WINTER WHEAT VARIETIES COVERING THE PERIOD FROM 1926 TO 1930, INCLUSIVE

| Variety | Annual and Average Yields in Bushels per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| Turkey 926 | .... | 30.6 | 27.0 | 32.3 | 22.2 | 28.0 |
| Black Hull | 19.6 | 29.3 | 43.4 | 31.5 | 9.5 | 26.6 |
| Karmont | .... | .... | 29.2 | 27.2 | 21.8 | 26.1 |
| Sevier 59 | 16.0 | 30.3 | 34.0 | Killed | 15.1 | 23.8 |
| Kanred | Killed | 25.3 | 31.1 | 25.7 | 9.6 | 22.9 |
| Kofod | .... | .... | 31.9 | 8.3 | 16.4 | 18.9 |

tions in wheat yields; as a result, nothing very definite can be given as to which variety will give the highest yield. Kofod and Sevier are doubtless unadapted to San Juan County conditions because of occasional winter-killing.

## SPRING WHEATS

Tested spring wheat varieties are listed in Table 5. Early Baart, as indicated by annual yields and averages, is best. However, a comparison of yields of spring wheats with winter wheats indicates that probably the

TABLE 5.—ANNUAL AND AVERAGE YIELDS OF SPRING WHEAT VARIETIES COVERING THE PERIOD FROM 1926 TO 1930, INCLUSIVE

| Varieties | Annual and Average Yields in Bushels per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| Early Baart | 10.0 | 12.6 | 8.7 | 21.2 | Killed | 13.1 |
| Marquis | 10.7 | ... | 5.1 | 17.4 | 13.5 | 11.7 |
| Chul | ... | 10.2 | ... | 17.4 | Killed | 13.5 |
| Hard Federation | 13.3 | ... | 6.5 | 12.4 | 3.4 | 8.9 |

only place for spring wheats in crop relationships for San Juan County because of low yield is in supplementing fall varieties in case of winter injury. The low yield of Federation may be accounted for partly because of maturing before summer rains started, while later varieties were benefited by late precipitation.

## SPRING OATS AND BARLEY

Two varieties of oats and two varieties of barley, the yields of which are given in Table 6, were tested from 1926 to 1930, inclusive. For oats, the later maturing Swedish Select gave a higher yield than Kherson; for

TABLE 6.—ANNUAL AND AVERAGE YIELDS OF SPRING OATS AND SPRING BARLEY COVERING THE PERIOD FROM 1926 TO 1930, INCLUSIVE

| Varieties | Annual and Average Yields in Bushels per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| Oats | | | | | | |
| Swedish Select | 11.8 | 50.3 | Failed | 47.2 | 21.1 | 28.3 |
| Kherson | 13.1 | 51.5 | Failed | 36.5 | 25.0 | 25.2 |
| Barley | | | | | | |
| Trebi | 9.6 | 28.5 | 15.2 | 16.9 | 14.0 | 16.8 |
| Baart | 8.4 | 27.2 | 9.0 | 13.1 | Not seeded | 14.7 |

barley, Trebi has given a higher yield than Coast. The acre-yield of Swedish Select oats has equaled exactly in pounds per acre the yield of Trebi barley.

The problem in connection with the successful growing of spring cereals for San Juan County is the adjustment of the date of seeding to meet the rather uncertain factor of the time and distribution of the rainfall. In seasons of relatively high spring rainfall early seeding is best with late seeding having a chance of failure, provided late summer showers do not occur. In other seasons late spring seeding will give highest re-

turns in case the spring has been dry followed by high late summer precipitation. This is a condition that cannot be remedied, thus leaving to the farmer the only alternative of so adjusting his cropping procedure and tillage practice as to meet this uncertainty with as much safety as possible.

## ROTATIONS

In the older dry-farm areas of Utah the system of cropping consists mainly of wheat alternating with fallow because of the fact that the major portion of the precipitation comes during the late winter and early spring followed by a dry summer. In San Juan County, located in the late summer rainfall belt, however, the situation is somewhat different. In this section there is a possibility of continuous cropping with a cereal such as wheat, oats, or barley alternating with a row crop such as potatoes, corn, sorghum, peas, or any of the feed root crops. The yields of the various rotations are given in Table 6. An examination of the data shows the yields to be rather low as compared to the same crops in other tests due to being located on rather poor soil. The data, however, have a comparative value. In observing the yield of wheat following the intertilled crops, little difference is noted, the range of which is 0.4 bushel. Comparing these yields with wheat following fallow, a difference of less than 1 bushel to an acre is shown, which is too slight to be significant. Such a practice, therefore, depends mainly on the profitableness of the row crop.

In noting the yields of potatoes, a 5-year average of 83 bushels is shown, with an average of 143.9 bushels for 1927. In this season, 1927, a single plat yielded 230 bushels. While domestic consumption demands for potatoes in San Juan County could be satisfied on a comparatively small acreage, there is a possibility for production of disease-free seed to be used by the large potato-producing areas. Even though the yields of corn and peas in this test are not as high as in other experiments already reported, the yields do show that such production might be profitable, provided some economic use were made of them.

TABLE 7.—ANNUAL AND AVERAGE YIELDS OF VARIOUS CROPS IN ROTATION OVER THE PERIOD FROM 1926 TO 1930, INCLUSIVE

| Rotation | Annual and Average Yields per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| Corn after wheat, lbs. | ... | 2260 | 1330 | 7360 | 3250 | 3550 |
| Potatoes after wheat, bus. | 56.1 | 143.9 | 59.7 | 97.0 | 58.3 | 83.0 |
| Peas after wheat | | | | | | |
| Fodder, lbs. | ... | 1740 | 1095 | 3150 | 579 | 1641 |
| Seed, bus. | ... | 11.6 | 7.3 | 21.0 | 3.8 | 10.9 |
| Winter wheat after corn, bus. | 12.2 | 16.6 | 29.5 | 8.7 | 10.8 | 15.6 |
| Winter wheat after potatoes, bus. | 12.3 | 21.7 | 25.0 | 10.2 | 10.5 | 15.9 |
| Winter wheat after peas, bus. | 11.6 | 16.5 | 26.8 | 10.7 | 12.0 | 15.5 |
| Winter wheat after fallow, bus. | 10.8 | 15.3 | 38.0 | 8.2 | 9.5 | 16.3 |

The tillage practice found to be most economic in connection with alternating a cereal and a row crop consists of fall plowing of the stubble land followed by early spring weeding and other necessary tillage before seed-

ing the intertilled crop. After the row crop is harvested, the only tillage necessary for the seeding of the cereal is disking and harrowing.

## RATE OF SEEDING WINTER WHEAT

Because of late summer rainfall allowing for a quick uniform germination of seed, the rate of sowing winter wheat in San Juan County is generally much less than in other dry-land areas of the state. The results of a rate-of-seeding experiment under test from 1926 to 1930, inclusive, are given in Table 8. These data show that a seeding of 2 pecks to an

TABLE 8.—RATE OF SEEDING KANRED WINTER WHEAT RANGING FROM 1 TO 6 PECKS, INCLUSIVE, FROM 1926 TO 1930

| Rate of Seeding | Annual and Average Yields in Bushels per Acre | | | | | |
|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | Avg. |
| 1 | Failed | 27.9 | 17.7 | 24.2 | 19.7 | 17.9 |
| 2 | Failed | 29.0 | 14.9 | 10.9 | 13.4 | 13.6 |
| 3 | Failed | 31.1 | 20.4 | 13.8 | 11.4 | 15.3 |
| 4 | 16.8 | 29.6 | 16.3 | 18.3 | 0 | 16.2 |
| 5 | 21.0 | 21.0 | 11.0 | 18.9 | 0 | 14.4 |
| 6 | 20.3 | 18.0 | 16.6 | 14.3 | 0 | 13.8 |

acre gave a higher yield than higher rates. The rate of seeding depends to a great extent upon the moisture condition of the soil and the time of seeding. If the seeding can be done early and in moist soil, 2 to 3 pecks apparently are sufficient, with delayed seeding requiring a greater rate; if the seeding is done in soil too dry to force a quick, uniform, germination, then the rate again needs to be increased. More data are needed, however, before definite advice on this point can be given.

## TIME OF PLOWING WINTER WHEAT

Time of plowing, an important factor in successful dry-farming in the northern part of the state, fails to carry the same importance for San Juan County, as indicated by the yields shown in Table 9. The soil, however, on which this experiment was located is poor as well as quite uniform, which might account in part for the data reversing the results of the Nephi substation in Juab County. The distribution of rainfall for San

TABLE 9.—TIME OF PLOWING FOR FALLOW INCLUDING FALL, EARLY, MEDIUM, AND LATE SPRING, FROM 1927 TO 1930, INCLUSIVE

| | Annual and Average Yields in Bushels per Acre | | | | |
|---|---|---|---|---|---|
| | 1927 | 1928 | 1929 | 1930 | Avg. |
| Fall plowed | 13.6 | 15.6 | 11.4 | 15.6 | 14.0 |
| Early spring plowed | 13.6 | 15.9 | 7.8 | 13.5 | 12.7 |
| Medium spring plowed | 19.5 | 14.6 | 9.6 | 7.6 | 12.8 |
| Late spring plowed | 17.2 | 16.2 | 17.0 | 4.2 | 13.6 |

Juan County may also be responsible for upsetting the normal expectation. It is possible that the late summer rainfall might have such an effect on the chemical and biological activity of the soil so as to almost completely mask the ill effect on yield of delayed spring plowing.

## BEANS

Because of the relatively high value of the crop, without question, beans have a future in San Juan County, provided price relationships and climatic conditions are favorable. Under normal conditions it is one of the crops which will stand a long hauling charge to shipping points.

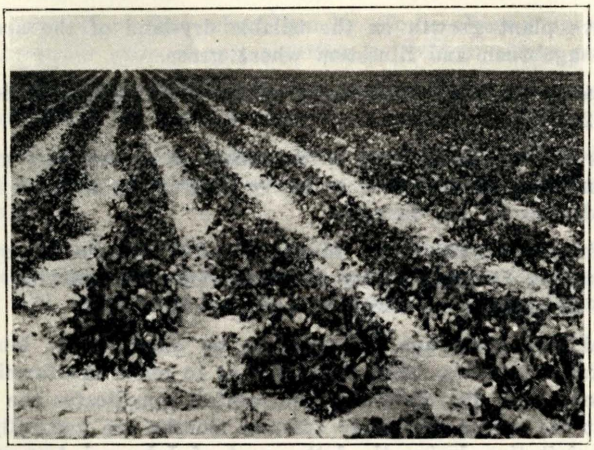

**Fig. 2.**—Beans grown on Experimental Farm with alternating crops of fall or winter wheat.

During the last five years a varietal test of beans has been included with the experimental projects of the substation, but during each season, with the exception of 1929, the crop was either frozen as soon as the plants emerged in the spring or was killed by frost before ripening in the fall. The crop was ruined by hail one year.

The following bean yields were produced in 1929:

| | |
|---|---|
| Mexican Red beans | 600 pounds per acre |
| Mexican Pinto beans | 247 " " " |
| White Navy beans | 115 " " " |

The yield of the Mexican Red variety is the only production which can be considered profitable.

In a cooperative test on the G. R. Hurst farm as Blanding (see cover cut), a section with a longer growing period and much freer from frost than the former location of the station, the following yields were produced in 1930:

| | |
|---|---|
| Mexican Red beans | 804 pounds per acre |
| Mexican Pinto beans | 772 " " " |
| Navy beans | 660 " " " |

These yields can be considered of economic value; furthermore, the section in which the test was conducted is fairly representative of a large area in the southern part of the dry-farm territory of San Juan County, extending from Blanding north and out into Colorado.

## SUMMARY AND CONCLUSIONS

San Juan County, located in the southeast corner of the state, has a dry-farm area of approximately 600,000 acres, one-third to one-fourth of which is covered by timber.

The native plant growth on the tillable dry-land of the area consists mainly of sagebrush and Bluestem wheat grass.

The elevation of the dry-land area of San Juan County varies between 6000 and 7200 feet.

The soils vary in depth from a few inches to several feet and vary in texture from fine sandy loams to heavy clays. The medium clay loams are best adapted for dry-farming.

At the former location (10.5 miles east of Monticello), frost has been a factor making for uncertainty in connection with growing the tender crops such as beans, corn, sorghum, and even alfalfa.

The total 3-year average precipitation, as measured at Monticello, is approximately 17 inches, which is sufficient to make dry-farming usually safe. However, the distribution of the rainfall complicates the crop problem in that the spring and early summer months are generally dry with heavier precipitation during the latter part of July and August.

Because of the distance to shipping points, the chief problem of San Juan County is transportation. While this condition has greatly improved during the last five years, still the shipping charge is prohibitive for products which have a low value per unit of bulk.

The San Juan County Experimental Farm was established in 1925 by special legislative action and was located at that time on the Garretson Farm, 10.5 miles east of Monticello. Because of soil variation and frost damage, a new site for the farm was chosen in the spring of 1931 on the William King Farm, 8 miles east and 6 miles south of Monticello near the center of the dry-farm area.

The ultimate purpose in establishing the Station was to determine the possibilities of alfalfa-seed production in this area.

During the five years in which results have been accumulated, alfalfa-seed formed only during one season and then in an insufficient amount to be profitable.

For hay, alfalfa has given an acre-yield of approximately 1 ton, with Grimm yielding highest.

As forage crops, Australian White Flint corn, sweet clover, and field peas are well adapted to San Juan County and should give profitable yields.

Root crops have produced favorable yields when good stands were secured.

Winter wheat is well adapted to San Juan County conditions, the highest yields being secured from Turkey 926, Karmont, and Black Hull.

Spring wheats have yielded only about half as much as the winter varieties. Early Baart was the leading variety in the test.

Oats and barley are fairly well adapted to the climatic and soil conditions of San Juan County. Swedish Select, the highest yielding variety, has produced in pounds the exact amount produced by Trebi barley, which in turn was highest in yield of the two barley varieties.

Rotation tests show that wheat can be grown alternating with a row crop with probably little, if any, sacrifice in yield to either crop.

Rate-of-seeding tests indicate that 2 to 4 pecks to an acre of winter wheat is sufficient for highest yields.

The time-of-plowing test, judging from results thus far obtained, shows little effect of delayed spring plowing as compared to plowing in fall or early spring.

Beans as a crop are well adapted to San Juan County conditions in those sections where the growing period is long enough to allow the plants to emerge with safety and mature seed without damage from frost.

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