Peanut Irrigation Studies in Oklahoma, 1956-1959

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This bulletin reports results of irrigation studies with peanuts. The studies were conducted by the Oklahoma Agricultural Experiment Station during the period 1956-1959. The purpose of the research was to determine the effect of different levels of irrigation on the yield, quality, and certain physical characteristics of peanuts.

EXPERIMENTAL METHODS AND CONDITIONS

The irrigation tests were located on the Floyd King farm near Eakly in Caddo county in 1956 and on the Agronomy Research Station near Perkins in 1957, 1958, and 1959. The water treatments in the test near Eakly were repeated three times in a completely randomized design. The tests at Perkins were replicated four times in a randomized block design. Only one variety, Argentine, was used in order to reduce the number of variables.

Seeds were planted in rows spaced 36 inches apart in the Eakly test and 40 inches apart in the Perkins tests. The rate of planting was three to four viable seed per foot. Each irrigation plot consisted of eight rows, fifty feet long. Plots in the tests were treated as follows:

W-1 Not irrigated.

W-2 Irrigated when the soil moisture tension in the 6- to 12-inch root zone reached approximately six atmospheres. This corresponded to soil moisture percentages of five percent for the 1956 study and seven percent for the 1957, 1958, and 1959 studies.

W-3 Irrigated when the soil moisture tension in the 6- to 12-inch root zone reached approximately two atmospheres. This corresponded to soil moisture percentages of eight percent in the 1956 studies and nine percent for the 1957, 1958, and 1959 studies.

W-4 Irrigated when the soil moisture tension in the 6- to 12-inch root zone reached approximately one atmosphere. This corresponded to soil moisture percentages of eleven percent for each of the four years.

A Sparling meter attached to the irrigation pipe was used to measure the amount of water applied. In 1956 and 1958, the main plots were divided into four equal sub-plots and fertilized as shown in Table 1. In 1957 all plots were side-dressed with 400 pounds of 6-24-24 one month after planting. No fertilizer was applied in 1959.

Table 1.—Summary of Field Operations and Conditions Used for Peanut Irrigation Studies.

	1956[1]	1957	1958	1959
Date Planted:	June 13	June 16	May 29	June 15
Date Fertilized:	July 13	July 17	June 20	None
Amount Fertilizer[2]				
Treatment F-0	0-0-0	All plots	0-0-0	
Treatment F-1	6-24-24	24-96-96	36-108-36	
Treatment F-2	12-48-48		72-216-72	
Treatment F-3	18-72-72		72-216-0	
Dates Irrigated:				
Treatment W-1	None	None	None	None
Treatment W-2	June 15 August 17	July 31 August 31	August 6 September 2	August 22 September 14
Treatment W-3	June 15 August 3 August 23 September 6	July 21 August 24	July 23 September 2 September 12	August 6 August 26 September 11 September 22
Treatment W-4	June 15 July 28 August 9 August 20 August 30 September 11	July 20 July 31 August 24	July 12 July 23 August 28 September 6 September 12	August 4 August 20 August 27 September 9 September 21
Date Dug:	October 23	October 28	September 26	November 12
Date First Killing Frost:	November 9	October 26	November 28	November 6
Date Picked:	November 8	November 11	October 7	November 22

[1] Test conducted on the Floyd King farm near Eakly. Subsequent years on the Perkins Agronomy Research Station nine miles south of Stillwater.

[2] Pounds of N, P_2O_5, and K_2O per acre.

The peanuts were picked with a Lilliston peanut picker modified for plot work. They were air-dried, cleaned, and weighed. Yields were converted to pounds of air dry, clean peanuts per acre.

The Oklahoma Federal-State Inspection Service at Durant graded the peanuts. In 1956, the replications from each water treatment were composited and a sample of one to two pounds from each composite was sent to the grader. In 1957 and 1958 samples were collected from a composite of replications I with III and II with IV. One sample of one to two pounds from each of the two composites was sent to the grader. In 1959 each replicate was sampled and four three-pound samples per treatment were graded.

A sieve test was used to determine seed size. Results were graphically analyzed assuming the size distribution to follow a normal curve. Mean size and relative variances were determined.

Weather Conditions

Only 1.86 inches of rainfall were measured between planting and harvest in the test area near Eakly in 1956. In 1957, 1958, and 1959 from May 1 to October 27, the amount of rainfall measured one mile north of the test site was 33.61, 21.99, and 45.59 inches, respectively. Graphic presentations of the average daily temperatures at Stillwater and the daily rainfall at Perkins from April 1 through November 30 for 1957 and 1958 are shown in Figure 1. Data for 1959 are shown in Figure 2.

The 1957 growing season had several days with maximum temperatures above 100° F. in late July and early August. The 1958 season had a few days above 100° F. in mid-August, and the 1959 season had one day with a maximum daily temperature of 100° F. The temperature had fallen rather sharply when the peanuts were dug in 1957, and in 1958 the temperature fell shortly after digging. In 1959, a very hard freeze had occurred before digging, and minimum temperatures the second and third days following digging were 10° and 8° F., respectively.

Rainfall was lacking from early July to early August in 1957. In 1958, it was adequate from late August to mid-September and again from late September to mid-October. In 1959, a lack of rainfall in August was followed by excessive moisture in late September and early October.

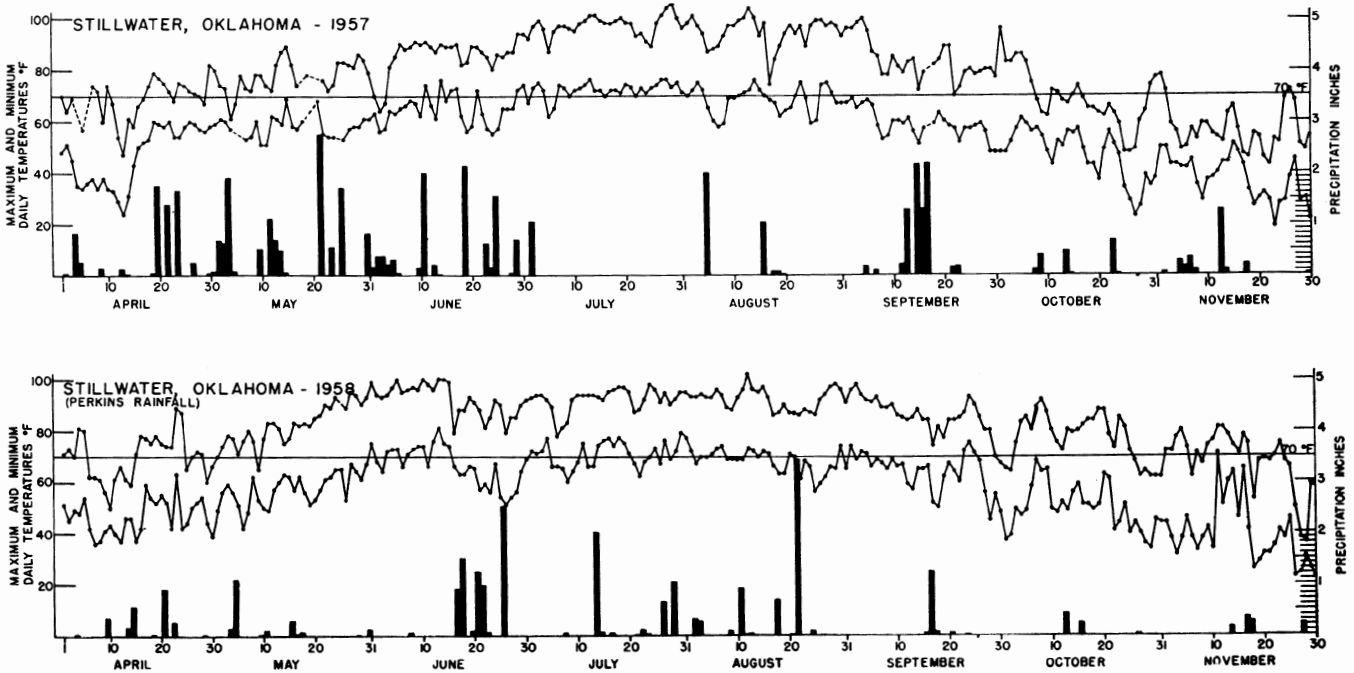


Figure 1. Daily rainfall and maximum and minimum daily temperature as listed in the U.S.D.A. Climatological Data for April 1 through November 30, 1957 and 1958.

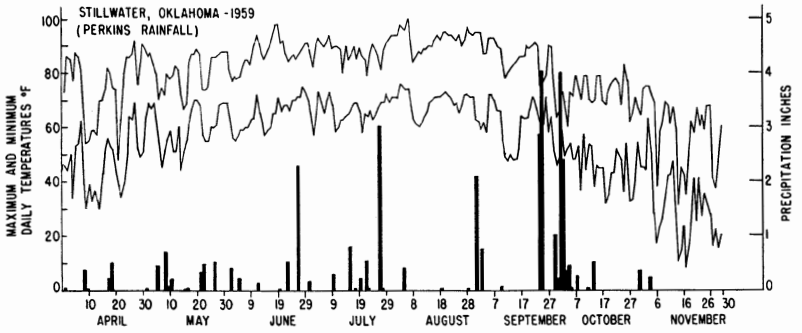


Figure 2. Daily rainfall and maximum and minimum daily temperature as listed in the U.S.D.A. Climatological Data for April 1 through November 30, 1959.

Mechanical Analyses of Soil

The soil type for the Eakly test was a Dill fine sandy loam. The Perkins test in 1957 was located on Teller fine sandy loam and in 1958 and 1959 it was on Vanoss loam. The soil at Eakly at the 0- to 6-inch depth was 84 percent sand, 9 percent silt, and 7 percent clay. At the 12- to 18-inch depth, it was 68 percent sand, 16 percent silt, and 16 percent clay. The 1958 and 1959 samples from Perkins at 0- to 6-inch depth contained 54 percent sand, 35 percent silt and 11 percent clay.

EXPERIMENTAL RESULTS

1956 Study

The results obtained in the 1956 irrigation study at Eakly (Table 2), indicated a significant difference among the mean yields for each water treatment. Though the W-4 treatment resulted in the greatest dollar increase per acre, the W-2 treatment resulted in the greatest return per inch of irrigation water. The value per ton was also highest for the W-2 level.

The proportion of sound mature kernels was considerably higher for the irrigated treatments, but there was no significant difference among the irrigated treatments for the percentage of sound mature kernels. The percentage of other kernels, including the small shriveled

Table 2.—Results Obtained in Irrigation Study with Peanuts at Eakly, Oklahoma, 1956.

	Water Treatments			
	W-1	W-2	W-3	W-4
Peanut yield (pounds per acre)[1]	213D	892C	1379B	2121A
Value per ton (dollars)[2]	162.88	212.25	209.53	206.43
Value per acre (dollars)	17.35	94.42	144.45	218.92
Yield increase over W-1 (pounds)		679	1166	1908
Value increase over W-1 (dollars)		77.07	127.10	201.57
Number of irrigations	0	2	4	6
Irrigation water (inches)	0	4.5	10.5	16.5
Total water (inches)[3]	4.3	8.8	14.8	20.8
Yield Increase (pounds per acre per inch)		151.0	110.9	115.6
Value of increase (dollars per acre per inch)		17.13	12.10	12.22
Sound mature kernels (percent)[1]	51B	65A	63A	63A
Other kernels (percent)	12	4	5	4
Damage (percent)	0	0	0	0 8
Shelling (percent)	63	69	68	68
Foreign material (percent)	23	7	2	2
Grams per 100 seed	29.8	32.8	35.0	37.8
Screen size:[4]				
21/64	6.1	5.7	2.9	3.9
19/64	26.3	24.8	34.5	36.1
17/64	35.2	47.0	42.6	39.9
15/64	32.6	22.5	19.9	20.1
Protein content (percent)	34.3	35.2	38.5	36.8
Oil content (percent)	46.7	44.8	43.2	43.3

[1] Means having the same letter are not significantly different at the 5% level. C.V.=11.6%.

[2] Calculated from the schedule for determining Producer's Loans Advance published in the Southwestern Peanut Growers' News. Inspection, storage and association expenses were not deducted.

[3] Irrigation, crop season rainfall, and soil moisture used.

[4] The screen size groups represent the proportion of kernel in the sample that remained on slotted screens with openings 21/64, 19/64, 17/64, and 15/64 inch in width and ¾-inch long.

kernels, was higher for those plots receiving no water. Again, there was no difference among the three irrigation levels.

In 1956 there seemed to be an increase in size of the peanuts as the water level increased. Mean sizes for the W-1, W-2, W-3, and W-4 treatments were 0.281, 0.285, 0.287 and 0.289 inches, respectively. In addition, the variance for the W-1 size distribution was the smallest, grading to the W-4 which was the largest. This indicates the seed were most closely grouped about the mean size in the W-1 treatment. Note that all the above sizes are within 1/64-inch (0.016 inch) of one another. The 1956 season was extremely dry and this size distribution pattern was not observed in subsequent years.

There was a slight increase in the protein content in peanuts from the irrigated treatments compared with those with no water. There was a tendency for the oil content to decrease as the water increased.

1957 Study

In the 1957 irrigation study at Perkins (Table 3), the medium level (W-3) produced significantly more peanuts than the low irrigation (W-2) and the no water treatment (W-1). The increase in both pounds and value per acre inch of water added was greatest for the medium water level. The W-2 and W-3 treatments received the same amount of water, but through more favorable timing (Table 1) the W-3 treatment gave a return of $88.79 more per acre.

Table 3.—Results Obtained in Irrigation Study with Peanuts at Perkins Agronomy Research Station, 1957.

	Water Treatments			
	W-1	W-2	W-3	W-4
Peanut yield (pounds per acre)[1]	1220C	1624BC	2396A	2148AB
Value per ton (dollars)[2]	152.02	161.09	182.81	148.19
Value per acre (dollars)	92.75	130.81	219.60	159.13
Yield increase over W-1 (pounds)		404	1176	928
Value increase over W-1 (dollars)		38.06	126.85	66.38
Number of irrigations	0	2	2	4
Irrigation water (inches)	0	6	6	12
Total water (inches)	18.3	24.3	24.3	30.3
Yield increase (pounds per acre per inch)		67.3	196.0	77.3
Value increase (dollars per acre per inch)		6.34	21.14	5.53
Sound mature kernels (percent)	42	44	52	39
Other kernels (percent)	10	16	8	14
Damage (percent)	11	7	9	11
Shelling (percent)	63	67	68	63
Foreign material (percent)	2.5	2.0	3.0	3.5
Grams per 100 seed	37.9	33.8	34.5	31.2
Screen size:[3]				
21/64	7.6	3.5	3.8	1.6
19/64	36.0	20.6	24.8	17.6
17/64	38.0	47.0	46.5	43.5
15/64	18.3	28.9	24.8	37.2
Protein content (percent)	32.6	27.5	26.0	24.4
Oil content (percent)	51.0	53.7	54.4	54.2

[1] Means having the same letter or letters are not significantly different at the 5% level. C.V.=11.9%.

[2] Calculated from the schedule for determining Producer's Loans Advance published in the Southwestern Peanut Growers' News. Inspection, storage and association expenses were not deducted.

[3] The screen size groups represent the proportion of kernels in the sample that remained on slotted screens with openings 21/64, 19/64, 17/64, and 15/64 inch in width and ¾-inch long.

The percentage of sound mature kernels was also highest for the medium irrigation level while the high water treatment had the lowest percentage of sound mature kernels. The medium water treatment had the lowest percentage of other kernels.

The size of the seed decreased slightly in 1957 as the water level was increased. The mean sizes of the seed for the W-1, W-2, W-3, and W-4 treatments, respectively, were 0.292, 0.280, 0.281 and 0.274 inches. There was a size difference of over 1/64-inch between kernels grown at the W-1 and W-4 water levels. Kernels receiving the W-2 and W-3 treatments were nearly 1/64-inch larger in size than those receiving the W-4 treatment.

The protein content decreased slightly as the water level increased. The oil content increased slightly for the irrigation treatments in comparison with the non-irrigated treatment.

1958 Study

The results of the 1958 study at Perkins (Table 4) showed that the mean yields for the three irrigation treatments were significantly higher than that of the W-1 treatment. The yield increases per inch of water added ranged from 22 to 25 pounds and were similar for each of the three water treatments. The value per inch of water added was greatest for the W-3 treatment.

There was no significant difference among the mean percentages of sound mature kernels for the four treatments at the 5 percent level of significance. There was a significant difference among the mean percentages of other kernels, with treatment W-4 having 10 percent of such kernels. The foreign material increased considerably for treatments receiving water because of soil clinging to the peanuts.

The mean grams per 100 seed for each of the irrigation treatments was less than that for the non-irrigated treatment. The mean seed sizes for the W-1, W-2, W-3 and W-4 treatments, respectively, were 0.291, 0.268, 0.268 and 0.259 inches. The W-1 and W-4 treatments were 2/64-inch apart. The variances in size distributions were not significantly different.

There was a tendency for the protein content of the irrigated treatments to be slightly less than that of the no water treatment. The mean oil content of each treatment was not materially different.

Table 4.—Results Obtained in Irrigation Study with Peanuts at Perkins Agronomy Research Station, 1958.

	Water Treatments			
	W-1	W-2	W-3	W-4
Peanut yield (pounds per acre)[1]	2657B	2821A	2919A	2951A
Value per ton (dollars)[2]	206.49	194.76	263.05	201.28
Value per acre (dollars)	274.20	274.71	383 85	296 87
Yield increase over W-1 (pounds)		164	262	294
Value increase over W-1 (dollars)		0.51	109.65	22 67
Number of irrigations		2	3	3
Irrigation water (inches)		7.44	10.44	11.88
Total water (inches)	19.38	26.82	29.82	31.26
Yield increase (pounds per acre per inch)		22	25	25
Value increase (dollars per acre per inch)		0.07	10.50	1.91
Sound mature kernels (percent)[1]	65.5A	65.0A	67.5A	64.0A
Other kernels (percent)[1]	6.2B	6.0B	4.8B	10.0A
Shelling (percent)	71.7	71.0	72.3	74.0
Foreign material (percent)	3.8	14.2	11.8	28.5
Damage	.25	.25	.25	.75
Grams per 100 seed	39.6	34.8	30.9	34.0
Screen Size[3]				
21/64	9.5	2.6	3.4	0.3
19/64	34.0	21.8	23.2	10.0
17/64	36.1	44.0	39.6	31.5
15/64	20.4	31.5	33.5	58.1
Protein content (percent)	32.2	28.6	28.5	30.6
Oil Content (percent)	50.0	52.0	53.3	51.2

[1] Means having the same letter are not significantly different at the 5% level. C.V.=11.6%.

[2] Calculated from the schedule for determining Producer's Loans Advance published in the Southwestern Peanut Growers' News. Inpection, storage and association expenses were not deducted.

[3] The screen size groups represent the proportion of kernels in the sample that remained on slotted screens with openings 21/64, 19/64, 17/64, and 15/64 inch in width and ¾-inch long.

1959 Study

In 1959 the mean yields of the peanuts in the irrigation study at Perkins were significantly higher for the irrigation treatments than for the no water treatment (Table 5). There were no significant differences in the mean yields among the irrigation treatments. The W-2 or low irrigation treatment showed the greatest increase in pounds per inch of water added. The medium and high irrigation treatments were very similar. The dollar value per inch of water added was also highest for the W-2 treatment.

A severe freeze occurred one week before and during the harvesting operations. Since the freeze was a factor separate from irrigation,

the percentage of sound mature kernels is reported in two ways in Table 5: disregarding freeze damage, and considering freeze damage. Although each treatment showed a high percentage of freeze damage, it is interesting to note that the low water and the high water treatments had less damage than the medium water and the no water treatments. This phenomenon did not appear to be related to the effect of water content of soil upon the thermal diffusivity of the soil. No explanation is offered for the phenomenon.

Table 5.—Results Obtained in Irrigation Study with Peanuts at Perkins Agronomy Research Station, 1959.

	Water Treatments			
	W-1	W-2	W-3	W-4
Peanut Yield (pounds per acre)[1]	1014B	2257A	2207A	2306A
Value per ton (dollars)[2]*	160.15	164.45	129.28	175.28
Value per ton (dollars)**	83.75	130.81	74.42	103.20
Value per acre*	81.20	185 58	142.66	202.10
Yield increase over W-1*		1243	1193	1292
Value increase over W-1*		104.38	61.46	120.90
Number of irrigations	0	2	4	5
Irrigation water (inches)		4.00	7.75	9.00
Total water (inches)	38.86	42 86	46.61	47.61
Yield increase (pounds per acre per inch)		310.8	153.9	143.6
Value increase (dollars per acre per inch)		26.10	7.92	13.43
Sound mature kernels*	51	55	41	58
Sound mature kernels**	1	12	4	12
Damage (percent)**	50	43	37	46
Other kernels (percent)**	17	11	17	12
Shelling (percent)	68	66	58	70
Foreign material	4.5	3.5	6 5	4.0
Grams per 100 seed	30.8	30.5	23.3	27.2
Screen size[3]				
21/64	3.4	5.3	2.7	2.1
19/64	13.0	13.5	9.5	9.6
17/64	37.6	42.6	34.2	40.8
15/64	46.1	38.4	53.8	47.5
Protein content (percent)	30.9	28.0	26.1	26.7
Oil content (percent)	49.6	49.9	51.0	47.4

[1] Means having the same letter are not significantly different at the 5% level. C.V.=16.4%.

[2] Calculated from the schedule for determining Producer's Loans Advance published in the Southwestern Peanut Growers' News. Inspection, storage and association expenses were not deducted.

[3] The screen size groups represent the proportion of kernels in the sample that remained on slotted screens with openings 21/64, 19/64, 17/64, and 15/64 inch in width and ¾-inch long

* Assuming no freeze damage.

** Based on actual percentage SMK, other kernels and damage.

The mean seed sizes for the W-1, W-2, W-3 and W-4 treatments were 0.268, 0.272, 0.260 and 0.265 inches respectively. The W-1 and W-4 treatments were similar and the greatest difference lies between the intermediate treatments, these differing by less than 1/64-inch. None of the variances in size distribution were significantly different.

The protein content decreased slightly as the irrigation was increased. The oil content changed very little for the W-1, W-2 and W-3 treatments but decreased sharply for the W-4 treatment.

Effect of Irrigation on Peanut Pod Characteristics

Some of the physical characteristics of the peanut pods from each irrigation treatment were studied in 1957 and 1958. The pod length, pod diameter, relative cracking strength and pod thickness measured at two positions are shown in Table 6. Representative peanut pods and kernels from each irrigation treatment in 1958 are shown in Figure 3. The peanuts were not separated according to maturity for the measurements.

Table 6.—Mean Pod Length, Pod Diameter, Pod Cracking Strength and Pod Thickness of each Water Treatment of Peanuts from the Irrigation Study on the Agronomy Research Station near Perkins, 1957-58[1]

		Water Treatments					C.V.
	Year[2]	W-1	W-2	W-3	W-4	Mean	%
Pod Length (cm.)	1957	2.32A*	2.33A	2.27A	2.25A	2.29	18.4
	1958	2.34A	2.18A	2.15A	2.17A	2.21	18.8
Pod Diameter (cm.)	1957	1.15A*	1.12B	1.13AB	1.11B	1.13	8.7
	1958	1.17A	1.12A	1.13A	1.11A	1.13	21.2
Cracking Strength	1957	38.0A*	32.7B	35.6AB	31.4B		46.9
(Relative)	1958	18.2A	16.7AB	15.0BC	13.1C		63.0
Pod Thickness (0.001")	1957	35.2A*	31.5AB	30.8B	29.2B		44.5
Position One[3]	1958	35.2A	35.3A	36.0A	33.2A		42.5
Position Two[4]	1957	42.5A*	39.3AB	38.4B	36.5B		36.0
	1958	43.5A	43.8A	42.0A	38.8A		41.0

[1] Data in 1957 obtained by John Beavers and in 1958 by Y. C. Soong in partial fulfillment for Masters degrees, O.S.U.

[2] Each mean was based on measurements of 160 pods in 1957 and 144 pods in 1958.

[3] Position one was measured at the dorsal distal suture.

[4] Position two was measured at the basal ventral suture.

*Means with one letter alike are not significantly different at the 5% level, using the multiple range test.

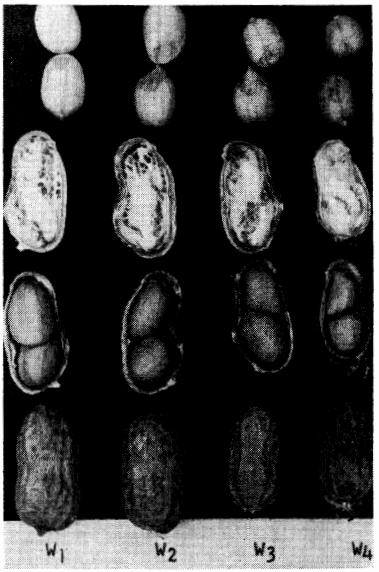


Figure 3. Typical peanut pods and kernels from each irrigation treatment in the Peanut Irrigation study, Perkins, 1958.

The differences in mean pod lengths for the irrigation treatments were not statistically significant. The mean diameters of the pods at the widest point on the basal end differed significantly among water treatments in 1957 but not in 1958. In 1957, the pods for the W-1 treatment were significantly thicker than those for the W-2 and W-4 but did not differ from those of W-3. Though the mean pod diameters were not significantly different at the 5% level in 1958, the trends were similar to those of 1957. The data indicate that the diameter of the pod decreased as irrigation level increased, but that the greatest difference was between the non-irrigated and the irrigated treatments.

The relative cracking strength of the pods was measured in a specially constructed device. (See Figure 4). In 1957 and 1958 the non-irrigated treatment (W-1) required significantly more pressure for cracking the pods than did the W-4 treatment. However, there were no significant differences in the W-1 and W-3 treatments in 1957 or the W-1 and W-2 treatments in 1958. There was considerable variation in readings obtained for cracking strength, as indicated by the high coefficients of variation of 46.9 and 63.0 percent in 1957 and 1958, respectively.

There were no significant differences among the mean pod thicknesses at two positions for the treatments receiving irrigation in 1958. In 1957 the mean thickness of pods from the W-1 treatment was significantly greater than those from the W-3 and W-4 treatments for both positions.

The data indicate a consistent trend for mean pod length and pod diameter to decrease as the water level increased, but the differences are small, being statistically significant for pod diameter only in 1957.

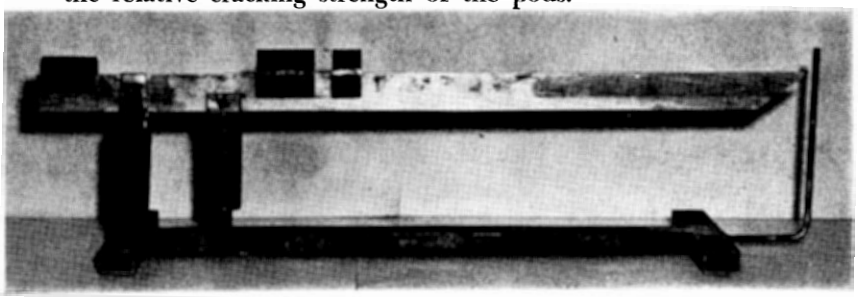
Tables 3, 4 and 6 show an interesting relationship with respect to shelling percent, cracking strength, and pod thickness. The W-4 treatment had thinner pods and a higher shelling percent than other treatments in 1958. One factor confounding the cracking strength results was that the larger kernels in the pods from the non-irrigated treatment, perhaps, were harder to crack because of the pressure of the kernels on the sides of the pods.

Effect of Irrigation on Flavor and Odor of Peanut Butter

The effect of irrigation on the taste and odor of peanuts was evaluated by taste panels in 1956 and 1958. Peanuts grown under each water treatment (W-1, W-2, W-3, and W-4) were made into peanut butter for evaluation.

Each panelist was given a plate containing approximately a teaspoon of each type of peanut butter. They were also given a commercial brand to taste and smell as a comparison to the samples being rated. They were asked to rate all samples as superior to, equal to, or inferior to the commercial brand. Unknown to the panelists, a sample of the commercial brand being used as the standard (S) was also placed on the plate to be rated with the other samples. The 1958 test also included a sample of peanut butter made by a commercial company from Argentine (A) peanuts grown under Oklahoma conditions. Each year, the commercial brand contained homogenized hydrogenated oil, the other samples did not.

Figure 4. Peanut pod cracking device specially constructed to measure the relative cracking strength of the pods.



Taste panel results indicated that the flavor and odor of peanut butter was improved by irrigation in a droughty year (1956) and that the quality was not impaired when peanuts were irrigated at a moderate rate in the more normal season (1958). In 1956, evidence of off-flavor and off-odor for samples from the W-1 and W-2 treatments was more frequent than in the W-3 and W-4 treatments when each was compared to the standard (Table 7).

Results of the 1958 tests are reported in Table 8. The panelists reported that samples W-1, W-2, W-3 and W-4 were inferior and sample A (made by a commercial company from Argentine peanuts grown in Oklahoma) was about equal to the standard in odor and taste. The order of preference indicated by the panelists was code numbers A, S, W-2, W-3, W-1, and W-4. At present, desirability and intensity of odor and taste are not clear-cut qualitative factors and the difficulty in distinguishing the difference is indicated by the array of diverse opinions of the panelists.

Table 7.—Percentage of the Panel Scoring Peanut Butter Samples Grown in 1956 Under Various Soil Moisture Levels Superior to, Equal to, or Inferior to a Standard.

Characteristic	Superior to Standard					Equal to Standard					Inferior to Standard				
	W-1	W-2	W-3	W-4	S	W-1	W-2	W-3	W-4	S	W-1	W-2	W-3	W-4	S
Odor	0	0	0	0	17	8	25	83	67	83	92	75	17	33	0
Intensity of odor	8	33	67	67	83	17	58	33	33	17	75	8	0	0	0
Desirability of odor	18	33	67	83	92	36	58	33	17	8	45	8	0	0	0
Mean	9	22	45	50	64	20	47	50	39	36	71	30	6	11	0
Taste	0	8	8	17	25	0	25	50	58	42	100	67	42	25	33
Intensity of flavor	0	33	33	50	75	8	33	67	42	17	92	33	0	8	8
Desirability of flavor	0	25	67	67	75	8	42	33	33	17	92	33	0	0	8
Mean	0	22	36	45	58	5	33	50	44	25	95	44	14	11	16

[1] Samples W-1, W-2, W-3, and W-4 were made from peanut butter grown with the following water treatments: (no water), (low water), (medium water), and (high water). The sample labeled (S) was the same as the commercial brand being used as a standard.

Table 8.—Percentage of the Panel Scoring Peanut Butter Samples[1] Grown in 1958 Under Various Soil Moisture Levels Superior to, Equal to, or Inferior to a Standard.

	Superior to Standard						Equal to Standard						Inferior to Standard					
Characteristic	W-1	W-2	W-3	W-4	S	A	W-1	W-2	W-3	W-4	S	A	W-1	W-2	W-3	W-4	S	A
Odor	15.4	15.4	7.7	15.4	7.7	0	30.8	30.8	30 8	15.4	76.9	92.3	53.8	53 8	61.5	69.2	15.4	7.7
Intensity of odor	46.2	30.8	38.5	30.8	92.3	84.6	46.2	61.5	46.2	38.5	7.7	15.4	7.7	7.7	15.4	30.8	0	0
Desirability of odor	61.5	23.1	46.2	38.5	76.9	69.2	38.5	76.9	38.5	30.8	15.4	23.1	0	0	15.4	30.8	7.7	7.7
Mean	41.0	23.1	30.8	28.2	59.0	51.3	38.5	56.4	38.5	28.2	33.3	43.6	20.5	20.5	30.8	43.6	7.7	5.1
Taste	0	0	7.7	0	30.8	61.5	7.7	7.7	0	0	53.8	38.5	92.3	92.3	92.3	100.0	15.4	0
Intensity of Taste	0	15.4	7.7	7.7	84.6	84.6	76.9	46.2	46.2	46.2	7.7	15.4	23.1	38.5	46.2	46.2	7.7	0
Desirability of Taste	6.3	0	0	7.7	100.0	100.0	62.9	53.8	46.2	46.2	0	0	30.8	46.2	53.8	46.2	0	0
Mean	0	5.1	5.1	5.1	71.8	82.0	49.2	35.9	30.8	30.8	20.5	18.0	48.7	59.0	64.1	64.1	7.7	0

[1] Samples W-1, W-2, W-3, and W-4 were made from peanut butter grown with the following water treatments: (no water), (low water), (medium water), and (high water). The sample labeled (S) was the same as the commercial brand being used as a standard. The sample labeled (A) was made commercially from Oklahoma-grown Argentine Peanuts.

DISCUSSION AND SUMMARY

Irrigation of peanuts resulted in improved yields during the four-year period, 1956-1959. Three levels of water were used—low, medium, and high. The highest yield increases over non-irrigated peanuts were obtained with the medium and high water levels. Though the maximum yield potential was not realized, the yields for each year gave an indication of the relative merit of the treatment.

In 1956 the highest mean yield in the irrigation test was about one-half that obtained in an irrigated variety test in Caddo county. The yield potential was not obtained in 1956, probably because of an inadequate supply of moisture during the stress periods. The higher percentage of clay in the soil on the Perkins Station may have contributed to the poor quality of peanuts for some of the irrigated treatments because of the lower water permeability and because of its effect on delaying the digging.

At Perkins, the wet seasons in the early spring delayed the date of planting until mid-June except in 1958. In 1958, the mean yields, sound mature kernels, and shelling percentages were higher than in the other years and the percentages of other kernels and damage were lower.

The data indicate that if the water supply is limited, two to three irrigations of about three inches each will produce the highest returns per acre per inch of water. Under these conditions, maximum returns per acre per inch of water added ranged from $10.50 in 1958 to $26.10 in 1959. The data also indicate that if the water supply is not limited, a higher irrigation level, *i.e.* 3 to 6 irrigations, depending upon rainfall, would give a greater return. The maximum returns per acre under these conditions ranged from about $202 to $384, however, the median value was apparently near $215.

The mean percentages of sound mature kernels increased for the low (W-2) and medium (W-3) irrigation treatments over that of the no water treatment (W-1). For the period 1956-1958, the mean percentages of sound mature kernels in the high water treatment (W-4) was higher than that of the no water treatment (W-1) but less than the medium (W-3) and low water (W-2) levels. Except in years of severe drought stress, there was an increase in the number of peanuts produced but a general decrease in the size of the kernels as irrigation levels were increased. Considering all four years and all water treatments the variance of the peanut size distribution curves were practically identical. The only deviation from this was observed in the 1956 season. The

grouping of peanut seed sizes about the mean size appeared to be independent of the season or the moisture treatment.

The foreign material tended to increase with irrigation as a result of more soil clinging to the pods of the peanuts produced under irrigation. This would likely not be a problem in very sandy soils or with proper digging and shaking equipment.

The data for the four-year period, 1956-1959, indicated a slight decrease in protein content in 1957, 1958, and 1959 as the irrigation level was increased. The pattern was not followed in 1956 probably because of the effect of severe drought stress on chemical composition. There was little effect on mean oil percentages among the various treatments in 1957, 1958 and 1959 while oil content in 1956 decreased slightly as water level increased. The mean oil content ranged from 51.0 to 54.4 percent in 1957 and from 43.2 to 46.7 percent in 1956 while the oil contents of the peanut seed in 1958 and 1959 were intermediate.

Taste panel results indicated that the flavor and odor of peanut butter was improved by irrigation in droughty seasons and that the quality was not impaired when peanuts were irrigated at a moderate rate in the more normal seasons.

Pod measurements indicated that there was a decrease in the length, diameter, thickness and pressure required for cracking peanut pods as the water level was increased. The measurements were made on peanut samples that were not separated according to maturity.