Table 1. Average yields of major forage and grain crops 1950-1979.

	Alfalfa (T/A)	Wheat (lbs/A)	Barley (lbs/A)	Sorghum (lbs/A)	Corn[2/] (lbs/A)
1975-1979	6.6	4360	3580	4145	4740
1970-1974	6.2	4070	3525	4155	1755[3/]
1965-1969	5.3	2975	3410	4335	2105[3/]
1960-1964	4.9	2555	3215	3825	1235[3/]
1955-1959	3.9	1905	2720	2030	1630[3/]
1950-1954	2.9	1565	2400	1835	714[3/]

1/ Source: Arizona Crop and Livestock Reporting Service.

2/ Average yield of corn in 1978 and 1979 was 6440 lb/A.

3/ Much of the Arizona corn acreage from 1950-1974 was Indian corn grown under dryland conditions.

Cost of Producing Forage and Grain in Arizona

Dr. Scott Hathorn Jr., Extension Economist

Alfalfa hay production in Arizona is concentrated in two counties--Maricopa and Yuma--where 77 percent of the crop was produced in 1979 (see Table 1). In 1979 Arizona produced 1.312 million tons of hay on 204,700 acres for an average yield of 6.4 tons per acre. Comparing 1979 data with that for the 1972-76 period average, acreage decreased about 4.7% and the yield per acre decreased slightly from 6.6 tons to 6.4 tons.

Wheat production is concentrated in Maricopa, Pinal, and Yuma Counties where 90 percent of the 1979 crop was produced. Arizona produced 286,200 tons of wheat in 1979 on 125,000 acres with an average yield of 2.29 tons per acre. Compared with 1972-76 five year average, 1979 Arizona wheat acreage declined 50 percent.

Maricopa and Pinal Counties are the principal producers of barley, producing 70 percent of the total crop in 1979. Total production in 1979 was 77,400 tons on 43,000 acres with an average yield of 1.80 tons per acre. Barley acreage in 1979 was down 45 percent from the 1972-76 average.

Sorghum grain is produced primarily in Cochise, Graham, Maricopa and Yuma Counties where 74 percent of the 1979 crop was produced. Arizona produced 143,140 tons of grain sorghum in 1979 on 72,000 acres with an average yield of 1.99 tons per acre. Compared to the 1972-76 average, the acreage devoted to grain sorghum declined 33 percent in 1979.

Although corn is produced in several counties with Cochise County as the principal producer, in Arizona it ranks second in order of production below wheat.

The profit contribution margin (sales less the variable expenses of production) was sufficient to cover all overhead expenses of 1980 alfalfa hay production and to return a profit of $8.54, 2.83, 6.88, 18.50 and 6.39 per ton in Cochise, Graham, Maricopa, Pima and Yuma Counties, respectively (see Table 2). Although the profit contribution margin in Pinal County was positive, (greater than zero) it fell short of covering all overhead expenses of production.

Yuma and Pima Counties were the only counties where 1980 wheat produced a profit (see Table 3). In all other counties considered, the profit contribution margin was greater than zero but not sufficiently large to cover all overhead expenses of production.

In the case of 1980 sorghum grain production the story is not encouraging. Sorghum grain was a money loser in 1980 in all of the counties except Yuma where it broke even (see Table 4). Again, the profit contribution margin was not large enough to cover all of the overhead expenses of production.

In a majority of the cases alfalfa and grain crops are grown in a crop mix containing cotton. As long as the profit contribution margin is positive and greater than zero the grower will make more profit from the crop mix by including the hay or grain crop in the crop mix, even though the enterprise itself does not show a profit. From observation, it appears that Arizona growers are well aware of this economic axiom and that they also put it into practice.

ble 1. Forage and Grain Production Data for Arizona, 1972-79

County and Crop	1972-76 Average			1979		
	Acreage	Yield[1/]	Production	Acreage	Yield[1/]	Production
		(lbs.)	(tons)		(lbs.)	(tons)
COCHISE						
Alfalfa Hay	9,520	5.2	50,000	9,500	6.5	61,700
Wheat	38,500	3,888	75,868	4,000	3,990	7,980
Barley	4,080	3,254	6,614	1,000	3,120	1,560
Sorghum	40,880	4,690	95,762	8,900	5,040	22,430
Corn	2,500	5,997	7,496	30,000	7,340	110,040
GRAHAM						
Alfalfa Hay	7,600	5.1	39,282	8,800	6.0	52,800
Wheat	3,980	4,008	8,102	2,400	3,960	4,750
Barley	5,700	3,696	10,414	1,800	3,600	3,240
Sorghum	20,760	4,398	45,444	8,000	4,760	19,040
Corn	120	5,033	302	4,000	8,230	16,470
MARICOPA						
Alfalfa Hay	95,340	6.6	625,920	83,500	6.4	532,500
Wheat	75,860	4,294	165,150	33,500	4,440	74,370
Barley	33,720	3,728	63,002	16,000	3,700	29,570
Sorghum	22,320	3,620	40,162	18,600	3,750	34,890
Corn	1,760	3,158	2,820	500	4,590	1,150
PIMA						
Alfalfa Hay	2,020	5.8	11,700	2,200	6.0	13,200
Wheat	8,800	3,834	17,178	2,600	4,280	5,570
Barley	4,800	3,628	8,446	2,000	3,840	3,840
Sorghum	6,700	3,414	10,474	3,200	3,920	6,270
Corn	100	2,520	126	-	-	-
PINAL						
Alfalfa Hay	17,280	5.4	92,520	15,500	5.5	85,300
Wheat	55,520	4,056	115,166	40,200	4,420	88,740
Barley	24,300	3,354	40,362	13,500	3,640	24,580
Sorghum	8,140	3,678	14,964	11,000	3,810	20,940
Corn	-	-	-	-	-	-
YUMA						
Alfalfa Hay	63,280	7.3	462,480	66,000	7.2	478,100
Wheat	64,040	4,272	139,478	36,300	5,220	94,740
Barley	4,360	3,428	7,242	7,400	3,360	12,430
Sorghum	7,700	3,436	13,092	16,000	3,700	29,570
Corn	980	3,336	1,630	-	-	-
OTHER[2/]						
Alfalfa Hay	19,760	6.9	135,498	19,200	4.6	88,400
Wheat	2,500	3,230	4,038	6,000	3,350	10,050
Barley	840	2,904	1,220	1,300	3,354	2,180
Sorghum	1,300	3,908	2,540	6,300	3,174	10,000
Corn	9,340	1,222	5,708	10,500	3,284	17,240
ARIZONA						
Alfalfa Hay	214,800	6.6	1,417,400	204,700	6.4	1,312,000
Wheat	249,200	4,140	524,980	125,000	4,580	286,200
Barley	77,800	3,534	137,300	43,000	3,600	77,400
Sorghum	107,800	4,168	222,438	72,000	3,980	143,140
Corn	14,800	2,172	18,082	45,000	6,440	144,900

1/ Alfalfa hay yield unit is tons.

2/ Principally Greenlee, Mohave, Navajo and Yavapai Counties.

Source: 1979 Arizona Agricultural Statistics.

Table 2. Projected 1980 Alfalfa Hay Production Costs and Returns in Selected Counties in Arizona

Item	Cochise	Graham	Maricopa	Pima	Pinal	Yuma
Seedbed preparation	$ 0	0	0	0	0	0
Planting and cultivating	$ 0	0	6	0	6	24
Crop irrigation	$ 248	90	87	129	225	66
Chemicals and application	$ 4	0	52	0	15	56
Harvest - post harvest	$ 83	190	140	117	175	181
Overhead	$ 162	213	215	183	182	239
Total cost per acre	$ 497	493	500	429	603	566
Yield, tons per acre (1979)	6.5	6.0	6.4	6.0	5.5	7.2
Break-even cost per ton	$ 76.46	82.17	78.12	71.50	109.64	78.61
Market price per ton	$ 85.00	85.00	85.00	90.00	91.00[a/]	85.00
Profit per ton[1/]	$ 8.54	2.83	6.88	18.50	-18.64	6.39
Gross receipts per acre	$552.50	510.00	544.00	540.00	500.50	612.00
Variable cost per acre	$270.57	188.29	241.43	210.15	384.76	264.07
Profit contribution margin[2/]	$281.93	321.71	302.57	329.85	115.74	347.93
Water cost per acre	$217.30[b/]	62.90[c/]	71.88[d/]	114.00[e/]	196.58	42.50[f/]
Water cost per acre foot	$ 38.35	8.99	11.50	19.00	31.45	6.00

1/ Profit per ton equals market price less the break-even cost per ton.

2/ Profit contribution margin equals gross receipts from an acre less the variable expenses of producing that acre.

a/ Alfalfa cubes.

b/ Pump water (Includes well depreciation, insurance, repairs, and energy).

c/ Water is a combination of surface and pump water.

d/ Water supplied by the Salt River Project.

e/ Water supplied by the Cortaro Water Users Association.

f/ Surface water from Colorado River.

Source: Yield data compiled from 1979 Arizona Agricultural Statistics.
Cost data compiled from 1980 Field Crop Budgets for the counties considered.

Table 3. Projected Wheat Production Costs and Returns in Selected Counties in Arizona, 1980

Item	Cochise	Graham	Maricopa	Pima	Pinal	Yuma
Seedbed preparation	$ 22	14	12	19	11	16
Planting and cultivating	$ 25	75	22	20	29	21
Crop irrigation	$ 142	56	35	73	106	32
Chemicals and application	$ 46	13	43	41	46	33
Harvest - post harvest	$ 32	61	38	45	42	40
Overhead	$ 94	85	141	75	95	92
Total cost per acre	$ 361	304	291	273	331	234
Yield, tons per acre (1979)	2.00	1.98	2.22	2.14	2.21	2.61
Break-even cost per ton	$180.50	153.54	131.08	127.57	149.77	89.66
Market price per ton	$130.00	130.00	130.00	130.00	130.00	130.00
Profit per ton[1/]	$-50.50	-23.54	-1.08	2.43	-19.77	40.34
Gross receipts per acre	$260.00	257.40	288.60	278.20	287.30	339.30
Variable cost per acre	$235.85	177.22	141.18	198.17	201.45	127.90
Profit contribution margin[2/]	$ 24.15	80.18	147.42	80.03	85.85	211.40
Water cost per acre	$127.82[b/]	37.46[c/]	27.33[d/]	63.33[e/]	93.04[b/]	19.50[f/]
Water cost per acre foot	$ 38.35	8.99	8.63	19.00	31.45	6.00

1/ Profit per ton equals market price less the break-even cost per ton.

2/ Profit contribution margin equals gross receipts from an acre less the variable expenses of producing that acre.

b/ Pump water (Includes well depreciation, insurance, repairs, and energy).

c/ Water is a combination of surface and pump water.

d/ Water supplied by the Salt River Project.

e/ Water supplied by the Cortaro Water Users Association.

f/ Surface water from Colorado River.

Source: Yield data compiled from 1979 Arizona Agricultural Statistics.
Cost data compiled from 1980 Field Crop Budgets for the counties considered.

Table 4. Projected Sorghum Production Costs and Returns in Selected Counties in Arizona, 1980

Item	Cochise	Graham	Maricopa	Pima	Pinal	Yuma
Seedbed preparation	$ 37	22	25	19	17	11
Planting and cultivating	$ 50	51	5	17	10	12
Crop irrigation	$ 149	54	63	70	133	37
Chemicals and application	$ 12	39	45	40	54	34
Harvest - post harvest	$ 39	68	35	47	41	42
Overhead	$ 102	83	136	74	89	86
Total cost per acre	$ 389	317	309	267	344	222
Yield, tons per acre (1978)	2.52	2.38	1.88	1.96	1.91	1.85
Break-even cost per ton	$154.36	133.19	164.36	136.22	180.11	120.00
Market price per ton	$120.00	120.00	120.00	120.00	120.00	120.00
Profit per ton[1/]	$-34.36	-13.19	-44.36	-16.22	-60.11	0.00
Gross receipts per acre	$302.40	285.60	225.60	235.20	229.20	222.00
Variable cost per acre	$250.25	169.34	160.08	191.99	213.28	122.84
Profit contribution margin[2/]	$ 52.15	116.26	65.52	43.21	15.92	99.16
Water cost per acre	$134.21[b/]	32.94[c/]	55.50[d/]	60.17[e/]	115.32[b/]	18.00[f/]
Water cost per acre foot	$ 38.35	8.99	18.50	19.00	31.45	6.00

1/ Profit per ton equals market price less the break-even cost per ton.

2/ Profit contribution margin equals gross receipts from an acre less the variable expenses of producing that acre.

b/ Pump water (Includes well depreciation, insurance, repairs, and energy).

c/ Water is a combination of surface and pump water.

d/ Water supplied by the Salt River Project.

e/ Water supplied by the Cortaro Water Users Association.

f/ Surface water from Colorado River.

Source: Yield data from 1979 Arizona Agricultural Statistics.
Cost data compiled from 1980 Field Crop Budgets for the counties considered.