In photo this page the three admire a sheaf of one of the stiff-trawed, high-yielding wheats which have had such an impact on Arizona agriculture. From left are: Charles R. Farr, Maricopa Extension Agent, J. H. Sossaman and his son, James J., both of Higley. It was on the Sossaman Farm that some of the earliest on-farm tests were conducted. In other parts of the state other University personnel (page 9) were also introducing the new feed grain crop. The U of A team include from left: Top row — R. G. Sackett, Assistant Agronomist, Agricultural Experiment Station and Executive Secretary, Arizona Crop Improvement Association; R. K. Thompson, Research Associate in Agronomy & Plant Genetics, Mesa Farm; Donald R. Howell, Yuma Extension Agent; — Middle row — James F. Armstrong, Pima Extension Agent; James W. Little, Pinal Extension Agent; John L. Sears, Graham Extension Agent in Charge; — Bottom row — E. B. Jackson, Professor of Agronomy & Plant Genetics, Yuma Farm; Carmy G. Page, Cochise Extension Agent in Charge; and C. L. Isaacson, Apache Extension Agent in Charge.

Impact of Introducing Stiff-Strawed, High-Yielding Wheats to Arizona Agriculture

*by Robert E. Dennis & Arden D. Day**

Arizona produced an average of 27,000 acres per year of wheat, 1964-66, with an average yield of only 2660 pounds per acre. Beginning about 1966, stiff-strawed, high yielding wheats from Centro Internacional De Mejoramiento De Maiz Y Trigo (CIMMYT) were introduced into our state with an on-farm test at the Jim Sossaman farm near Higley. Changes the introduction of new wheats brought to our agriculture are shown in Table 1.

Wheat acreage has now increased eight-fold. Yield is up 60 percent to 4,200 pounds per acre. The Arizona wheat crop in 1973 approached one-half million tons with a gross value of $45,000,000.

The stiff-strawed Mexican wheat seed for the International Spring Wheat Nursery at the Sossaman Farm was provided by Nobel Prize winner Norman Borlaug of CIMMYT in 1965.

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Charles Farr, Maricopa County Agricultural Agent, made arrangements for and helped establish this on-farm test. He and David Ammon, Extension Agronomy Assistant, harvested the matured crop from this now historic on-farm test.

"We were glad to let Chuck put the test on our farm," said J. H. Sossaman. "We weren't growing much wheat at that time because barley was higher yielding. In addition, our barley always lodged and often lay in the furrows at harvest time."

Table 1. Acreage, yield and total production of wheat for grain in Arizona, 1964 to 1973.

Year	*Acres Harvested (thousands)*	*Yield (Lbs./ acre)*	*Production (Thousands of tons)*
1964	33	2,880	47.5
1965	26	2,700	35.1
1966	23	2,400	27.6
1967	50	2,940	73.5
1968	52	3,120	81.1
1969	73	3,720	135.8
1970	150	4,140	310.5
1971	173	4,080	352.9
1972	170	4,080	346.8
1973	214	4,200	449.4

James J., his son, said, "The wheats in the test stood up well and produced yields considerably higher than those obtained from the old variety, Ramona 50. It's gratifying to see the way these new wheats have helped farmers — and have provided grain for Arizona's growing livestock industry."

The results of the 1966 Sossaman on-farm test are reported in Table 2.

Many of the high yielding entries in the Sossaman test provided by Dr. Borlaug were then experimental lines. The names appearing in the table are those assigned later by Centro Internacional De Mejoramiento De Maiz Y Trigo. After yield results for the 1966 Sossaman test were obtained, it was crystal clear that the named variety then available, Sonora 64, should be carefully observed throughout lower elevation irrigated areas of Arizona.

Gene Lorance, agronomist with the Western Cotton Products Division of Anderson-Clayton, volunteered to ob-

R. G. Sackett

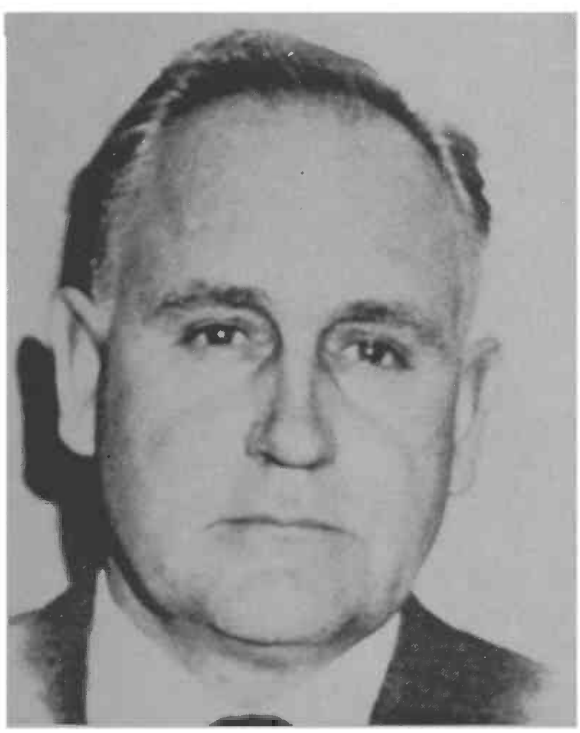
R. K. Thompson

Donald R. Howell

James F. Armstrong

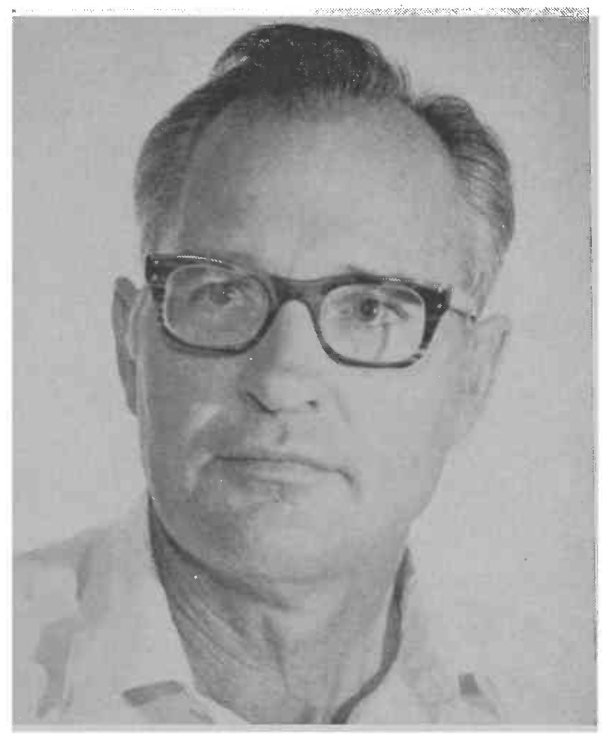
James W. Little

John L. Sears



E. B. Jackson

Carmy G. Page



C. L. Isaacson

tain 300 pounds of Sonora 64 seed from Anderson-Clayton seed sources in Mexico. This planting seed was distributed to Don Howell, Yuma Agricultural Agent; Jim Little, Pinal Agricultural Agent; and Charles Farr. Each established on-farm tests so that growers in their respective counties could see the high yielding potential of the new Sonora 64.

Tests were located at William G. Brandon's farm, Queen Creek, the Floyd Spar farm at Roll, and the Parke Gilbert farm near Casa Grande. Yield results from these tests again revealed superiority of the short, stiff-strawed Sonora 64. In fact, the results were so good we could hardly believe it possible.

Arizona is fortunate to have excellent plant breeders in the Agricultural Experiment Station who have contributed greatly to this program. Also, small amounts of seed which originally came into this country under the most exacting conditions need to be reputably expanded so that enough seed is available to all growers at a price they can afford to pay. For this we depend on our Arizona Crop Improvement Association as well as the cooperative members of the commercial seed dealers in our state.

On-farm tests concerning cultural practices have gone hand in hand with variety evaluation. Extension Agent Howell has completed three years of date-of-planting tests. Extension Agent Jim Little of Pinal, who speaks Spanish, has developed and maintained close working relationships with Research and Extension workers in Mexico. He has tested dozens of lines and varieties in Pinal County. Farr has continued with carefully planned Extension programs so as to help farmers obtain all possible benefits from the introduction of the new varieties.

Since the Sossaman test, new strains and varieties have been evaluated each year. Now there are several varieties superior to Sonora 64 in productivity.

The Mexican wheats are also grown in Pima County, but adaptive research by Jim Armstrong, Pima County Agritultural Agent, has shown that spring barley often has an edge on the spring wheats there, when both are grown as winter-annuals. This is reasonable since wheats from Mexico were developed for warm climates. Jim has given principal emphasis to water use and other cost of production studies for barley and wheat.

Table 2. Wheat Variety Test — Sossaman Farm, 1966.

Country of Origin	*Variety or Experimental Entry*	*Yield (% of Ramona)*
Mexico	**Bajio 66**	**176 a**
Mexico	**Sonora 64**	**173 a**
Mexico	**Jaral 66**	**162 a**
Australia	**Mendos**	**130 b**
Mexico	**Roque 66**	**130 b**
Mexico	**Penjano 62**	**130 b**
U. S. (Arizona)	**Arizona 5525-4 (Maricopa)**	**121 bc**
Mexico	**Pitic 62**	**121 bc**
Pakistan	**C-271**	**121 bc**
Mexico	**Nainari 60**	**116 bc**
U. S. (Arizona)	**Onas 53**	**114 bc**
Mexico	**Sonora 64-Knott A, 18892-2M-3Y-5M-26**	**114 bc**
Mexico	**8156 (White Grain)**	**113 bc**
Argentina	**Klein Pendidor**	**112 bc**
Pakistan	**Pakistan (Lyall Apur) 5747**	**107 bcd**
Mexico	**Lerma Rojo**	**103 bcd**
U. S. (Arizona)	**Ramona 50**	**100 bcd**
Columbia	**Crespo**	**98 cde**
U.A.R.	**Giza 144**	**93 de**
Australia	**Gabo**	**92 de**
Argentina	**Klein Petiso-Rafaelo**	**83 def**
Brazil	**Carazinho**	**74 ef**
U.S.A.	**Crim**	**71 ef**
Columbia	**Bonza 55**	**70 ef**
U.S.A.	**Chris**	**55 f**
Mexico	**TZP-AN64, 19025-10CM-101Y-100C-2Y**	**50 fg**
U.S.A.	**Justin**	**19 g**
Canada	**Selkirk**	**19 g**

Yields followed by the same letter are not significantly different at .05 level by Student Newman Keul's test.

The new wheat varieties have been evaluated at the higher elevations in the second phase of the spring wheat introduction effort. On-farm tests have demonstrated that these varieties are stiff-strawed. Wheats may be planted in March and harvested in June with economic yields at elevations above 3000 feet. Use of wheats in this way is catching on and acreage of spring planted wheat at higher elevations will probably increase. These on-farm tests have been led by Carmy Page, Cochise County Agricultural Agent; John Sears, Graham County Agricultural Agent; Leonard Isaacson, Apache County Agricultural Agent; and Amos Underwood, formerly Navajo County Extension Agent, now deceased.

It is of interest that Orville Vogel's work in Washington paralleled that of Dr. Borlaug. The two breeders worked hand in hand in development of better wheat varieties with Vogel giving his attention to winter-wheats. Because of this, Arizona's principal winter-wheat variety is now the high-yielding Nugaines. With the winter and spring wheats at the higher elevation, on-farm tests have been conducted at the Phelps Dodge Experimental Area managed by Charles Davis and located near Hereford; Charles Kimzey farm, Cochise County; Augusta Flake farm, Snowflake; Wayne Peterson farm near Willcox; Carl Bowman farm, Safford; Verle Palmer farm, Eden; and the Patterson farm managed by Jim Hauser at St. Johns. Each of these farmers have given of their time and resources to make these tests possible. The program would never have moved forward without their help.

The progress for wheat is significant, but it is only the beginning. One-third of Arizona's farmers obtain yields at least 1000 lbs. per acre above the state average yield. Yields of more than 5 tons per acre have been reported.

What will the average yield of wheat be in 1980? No one can really be sure. But we can be sure that University Extension Agents and Researchers will continue to work with farmers and all segments of Agri-business to, as 4-H-ers say, "Make the Best Better."