THE QUALITY OF WHEAT IN OKLAHOMA DRILL BOXES

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Bachelor of Science in Agriculture

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Stillwater, Oklahoma

1979

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
December, 1981

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DRILL BOXES

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PREFACE

The author wishes to express his sincere appreciation to his major adviser, Dr. F. E. LeGrand, for his continuous support and direction throughout this study. Without his encouragement this study would not have been possible. Appreciation is also expressed to the committee members, Dr. E. L. Smith, Dr. T. F. Peeper, and Dr. R. L. Westerman for their invaluable assistance in the course of this study. A note of thanks is given to Dr. P. L. Claypool for his assistance in providing the programming needed for statistical analysis.

Grateful acknowledgement is made to the Oklahoma Crop Improvement Association for the assistance in laboratory analyses of the samples collected. In addition, appreciation is extended to the many County Extension Directors and Area Agronomists for their efforts in supplying samples for the study. Finally, gratitude is expressed to the Oklahoma Wheat Commission for the finiancial aid that made this study possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Wheat is the most important cultivated crop in Oklahoma. Wheat producers should not only be concerned with fertilizer, herbicide, and equipment needs but also the quality of seed they plant. What is meant by high seed quality? One of the main components of good seed quality is the absence of noxious and common weeds. Other qualities, however, such as high germination, mechanical purity, and genetic purity percentages, and low inert matter and other crop percentages are also essential for high quality seed.

Before a lot of seed can be labeled as a certified class of wheat it must first exceed the minimum standards for germination rate, mechanical purity, inert matter, other crop seed, weed seed, and genetic purity. Thus, certification insures high quality seed. To insure that the quality of planting seed will not become a limiting factor in wheat production farmers need to make certain their planting seed is high quality. Most wheat farmers plant their own seed or seed obtained from a neighbor. Only a small portion purchase seed known to be of high quality. The use of certified seed has never been widely practiced in Oklahoma. In 1957, only 1.8% of the total wheat acreage was planted to certified seed (5). Only 0.3% was planted to certified wheat in 1980 (16).

Some 75% of the wheat acreage in Oklahoma is planted in 22 counties. Each of these major wheat producing counties will plant over 150,000 acres to wheat annually. This study was initiated to determine the quality of wheat seed planted in 16 of these counties.

CHAPTER II

LITERATURE REVIEW

Seed quality has long been recognized as one of the most often overlooked factors of many that limit crop production. Obviously, the production of a superior product, in terms of both quality and quantity, cannot be expected when poor quality seed is planted. Drill box surveys are designed to determine the quality of seed actually planted by farmers and have proven to be valuable tools in many states over the past 30 years in the assessment of seed quality. They have often been conducted on small grains by Crop and Seed Improvement Associations throughout the United States and Canada. Letters were written to these organizations requesting copies of their most recent drill box surveys. Of the 21 states responding, 11 had conducted drill box surveys. These 11 states responded by sending a total of 16 surveys. It was from these 16 surveys that this literature review was compiled. It should be noted that not all of the drill box surveys were formally published. The data of some surveys were disseminated via news letters, inter-departmental memorandums, and private correspondence.

There are several options available in the execution of drill box surveys. Most researchers made use of Extension Personnel to collect their samples. Extension Personnel included Area Agronomists, District Agriculturalists, Agricultural Fieldmen, and County Extension Directors (1, 3, 5, 7, 9, 11, 13, 14, 19, 20). Some studies involved Vocational

Agriculture Instructors and F.F.A. Chapters (1), while still others involved 4-H Chapters (7). A number of surveys did not mention the personnel used to collect the samples (2, 8, 10, 12).

One essential component of any drill box survey is complete randomization of the sampling sites. Nine of the surveys reviewed delegated the responsibility to provide randomization to the Extention Personnel (1, 3, 7, 9, 11, 13, 14, 19, 20). No mention of the approach to provide randomization was made in four surveys (2, 8, 10, 12). The study conducted at Kansas was the only survey tabulating results for wheat that mentioned randomization of samples had been insured by the Crop Improvement Association (9). In this study 1,524 names of Kansas wheat producers were selected at random from a list of producers obtained from the State Board of Agriculture. Samples were distributed across the state to get an average of 15 farmers per county in the western and central crop reporting districts while 10 farmers per county were selected for the eastern crop reporting district. Area Agronomists then collected samples from these designated individuals. Likewise, Grandstaff and Stroike (5), obtained a list of Oklahoma soybean producers from the State Crop Reporting Service and collected samples from 177 randomly selected names from this list.

Different comparisons can be made to contrast high users low quality seed. Some of the most important are as follows: (1) Survey data can be compared to state seed standards as set forth by the State Department of Agriculture, (2) Non-certified seed can be compared to certified seed or to the minimum standards of certified seed as set forth by the seed certifying agency of the state, (3) Cleaned seed may be compared to non-cleaned seed, (4) Seed produced by the farmer himself can

be compared to seed obtained from another farmer, seed purchased from a seed dealer, or seed purchased from a local elevator.

In 1973, research conducted at Alberta Canada compared survey data to Canada Seed Grade Standards (20). These standards include such factors as germination, genetic purity, purity as to other crop seeds, weed seeds, quality, disease, etc. Their survey did not consider genetic purity, quality nor disease other than ergot. Table I summarizes the results of tolerances of the lowest seed grade, Canada No. 2 Seed.

TABLE I

CANADA SEED STANDARDS FOR BARLEY[1]

	Primary Noxious	Primary & Secondary Noxious	Total Weed Seeds	Other Crop Seeds	Ergot	Germination Rate
Canada No. 2	96	144	2,400	7,200	144	75%

[1]Maximum number per bushel except for germination rate which is the minimum allowed.

Their results show that over 33% of all samples collected failed to pass these lax standards.

Comparing survey results to certification standards was by far the most popular means used to determine seed quality. Comparisons between certified and non-certified seed were made in all surveys except for the Alberta Canada survey, which used Canada Seed Grade Standards for

In ten surveys of wheat seed less than 15% of the wheat planted was certified seed (1, 3, 4, 5, 7, 9, 11, 12, 13, 19). The range was from .07% in Mississippi (4) to 15% in Manitoba, Canada (12). In each of these surveys certified seed was proven to be of higher quality than non-certified seed. Typical data from research conducted by Kinch (10) on wheat, oats, barley and flax illustrates this point. They found that 81% of the wheat samples were unfit for planting purposes if minimum seed certification standards were used as a guide for determining seed quality. The average percentage of certified seed use in crops such as soybeans, cotton and flax was generally twice that of the small grains.

Cleaned seed consistently proved to be of higher quality than non-cleaned seed. Results from Lipscomb county Texas, showed wheat samples that were cleaned contained an average of only 90 weed seeds per bushel while those that were not cleaned contained an average of 2,328 weed seeds per bushel (7). Similar results from Deaf Smith county, Texas revealed that cleaned samples contained an average of 1.92% inert matter and non-cleaned samples contained 3.00%. The survey conducted at Manitoba, Canada, which included wheat, barley and oats, found that 17% of their samples were not cleaned (12). All of these samples graded "Rejected". In most cases this rejection was a result of the presence of excessive weed seeds. In a North Dakota survey two percent of the wheat samples were not cleaned and contained an average of 66,000 weed seeds per bushel (19). It is apparent that seed cleaning can play a vital role in improving seed quality.

Another popular method of determining seed quality was found to be the comparison of seed sources. All 16 surveys included an analysis of seed sources. The combined data of all surveys showed that nearly 65%

of all farmers plant seed they produce themselves. Approximately 15% and 20% will obtain their seed from another farmer and from seed dealers, respectively. Less than five percent plant seed obtained from elevators. Manitoba results revealed that 60% of farmers who produce their own seed, plant seed that will not pass minimum certification standards (12). Only 21% and 17% of those samples obtained from another farmer or a seed dealer, respectively, failed to meet the same standards. In addition, wheat farmers planting their own seed planted an average of 7,560 noxious weed seeds per bushel. Individuals planting another farmer's seed and seed purchased from seed dealers planted an average of 60 and 12 noxious weed seeds per bushel, respectively (12). The 1958 survey prepared by Delouche and Bunch (4) showed that over 27% of the growers using their own seed and over 26% of the growers using another farmer's seed were planting over 6,000 noxious weed seeds per bushel. Furthermore, they found that over 32% of the growers using another farmer's seed or their own seed did not know the varietal name of the wheat they were planting.

Helmer (6), conducting research on cotton, found that average germination percentages of cotton originating from certified seed producers varied from 80.8% to 91.2%, while non-certified seed had germination percentages varying from 8.5% to 96.5%.

Planting high quality seed contributes greatly toward the realization of maximum profits. A general consensus of all surveys dealing with the small grains was that almost without exception the lowest quality seed being planted was the farmer's own seed.

Several of the studies included varietal purity tests. Portions of the samples were planted and as many "off types" as possible were

identified. Carlson's (3) results showed that in 1957 over 5% of Oklahoma wheat farmers completely mislabeled the variety of wheat seed they were planting. Of the 601 samples taken in this survey 38% were planting seed with varietal mixtures. Jacques (9) in Kansas showed that 10% of Kansas wheat farmers mislabeled their samples, and approximately 50% planted seed contaminated with varietal impurities. His work also showed that 81.3% of certified samples were completely free of contaminates from other varieties while 57.9% of non-certified seed was free of varietal impurities.

One of the primary goals of any Crop Improvement Association is to encourage the use of high quality seed. Periodically conducted drill box surveys can monitor the success of their efforts. Two surveys in Canada, one conducted in 1968 and the other in 1974, indicated that "Alberta's seed seemed to have improved only minimally" (18, p. 2). All the responsibility for improving seed quality does not belong to Crop Improvement Associations. The majority of the responsibility rests with the farmers themselves. Kinch (10) observed that those farmers who cleaned their own seed or who had their seed cleaned commercially were planting more weed seed than those planting uncleaned seed. Either seed cleaning operations were inadequate or those farmers planting uncleaned seed already had a good quality seed and didn't bother to have it cleaned. Even though, on a survey wide basis, cleaned seed proved to be better quality than seed not cleaned, seed cleaning does not guarantee high quality seed. Murphy (14) reported the average germination rate of Missouri soybeans in 1955 as 77.4% while in 1978 they averaged over 86%. This increase of nearly 10% was thought to be due to the 20% increase in the use of certified seed. In 1955, 46% of the samples were contaminated

with weed seed but only 13% contained weed seed in the 1978 survey.

Drill box surveys have been utilized in many different states in the United States and Canada for monitoring the quality of seed being planted. These surveys have provided the basic approach and methods used in this thesis.

CHAPTER III

MATERIALS AND METHODS

There are 22 major wheat producing counties (each planting over 150,000 acres yearly) in Oklahoma (17). They are: Alfalfa, Beaver, Blaine, Caddo, Canadian, Cimarron, Cotton, Custer, Garfield, Grant, Harper, Jackson, Kay, Kingfisher, Kiowa, Major, Noble, Texas, Tillman, Washita, Woods and Woodward. Sixteen of these major wheat producing counties were selected for this study were: Alfalfa, Blaine, Beaver, Caddo, Canadian, Custer, Harper, Jackson, Kingfisher, Kiowa, Major, Tillman, Texas, Washita, Woods and Woodward. The remaining six counties could not be sampled due to technical difficulties.

An Oklahoma Department of Transportation highway map of each county provided a systematic approach to collecting the samples. These maps are divided into townships and further divided into sections. One section, randomly selected within each township, was designated as being the section from which a sample was to be taken. This approach provided uniform distribution of the samples across the entire county (Figure 1).

A total of 672 samples were expected to be collected from the 22 counties to be surveyed but because six counties could not be sampled only 424 samples were actually collected. Of these 424 samples the questionnaires of 34 were incomplete and were deleted; thus, the data of 390 samples were analyzed. As a result each sample represented approximately 10,000 acres of wheat. The number of samples to be taken per

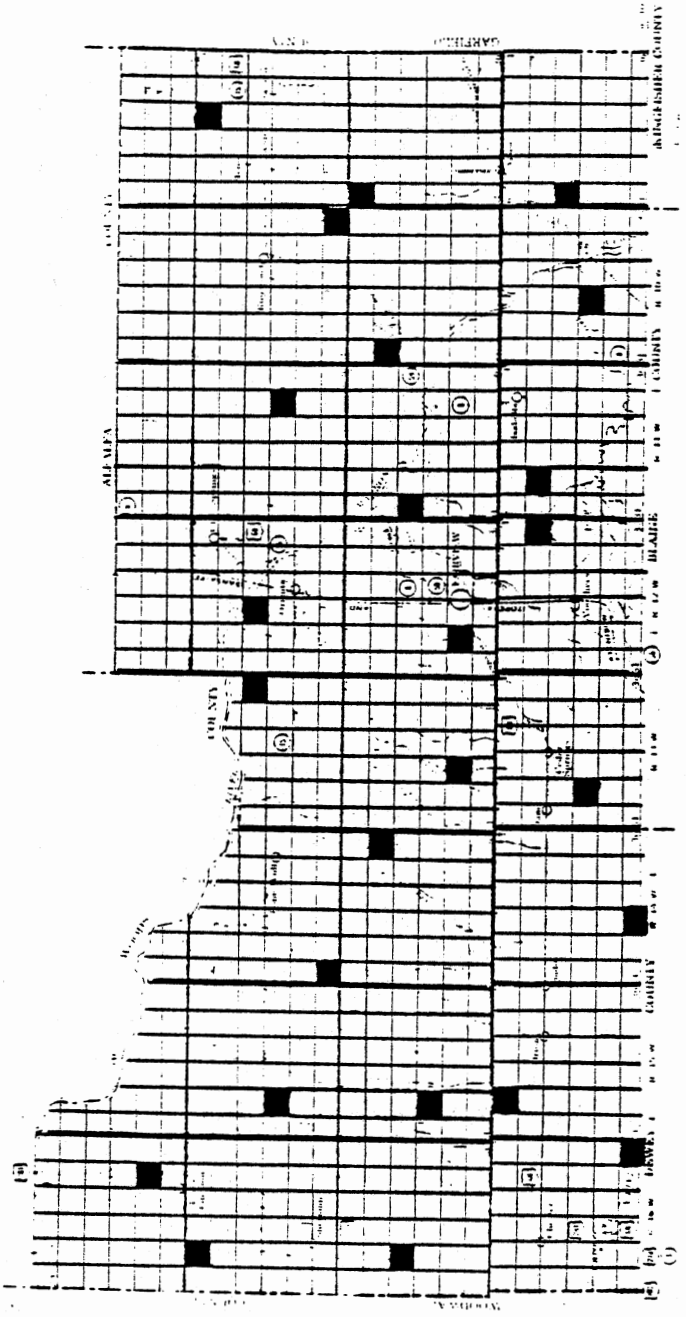


Figure 1. Highway Map of Major County Showing Sections Randomly Selected Within Each Township

county was found to correlate very closely to the number of townships per county. Thus, in general one sample was taken in each township. Notable exceptions to this sampling plan did exist, this was due to the number of acres of wheat per county. In Alfalfa county two samples per township were taken while in Beaver, Harper, Jackson and Texas counties one sample was taken for every two townships.

The two pound samples were collected by county Extension iDrectors and/or Area Agronomists in the fall of 1980. Sample bags, questionnaires (as shown in Figure 2) and procedures for sampling were sent to each sampler. Every effort was made to take the samples directly from the drill boxes. The samplers were instructed to collect samples and fill out the questionnaires in each designated section in their county. If there was no wheat being planted in that section they were instructed to move to the next higher numbered section in that township until a sample could be collected. Figure 3 illustrates how sections are numbered in any given township.

Upon arrival at Stillwater, Oklahoma, a portion of each of the 390 samples was planted on the Stillwater Agronomy Research Station. This planting consisted of 5 rows 15 feet long. All samples were seeded at the rate of 72 pounds per acre in 12 inch rows. All samples of the same variety were planted together for observation purposes. The planting date was November 29, 1980. A sprinkle irrigation of approximately 2.5 inches on November 30 was needed to germinate the crop.

During the growing season two applications of Malathion applied at a one-half pound per acre rate were required for the control of greenbugs. One application of ammonium nitrate was also applied at a rate of 20 pounds of actual nitrogen per acre on March 26, 1981.

QUESTIONNAIRE

1. Identification number_____

2. Variety planted_____

3. Acres planted with this seed_____

4. Seed source - Home grown_____Another farmer_____

   Dealer_____

5. Was seed cleaned_____yes _____no _____don't know

6. Was seed treated - Fungicide _____ _____don't know

   Insecticide _____ _____don't know

7. Seeding rate_____

8. Was seed laboratory tested _____yes _____no

9. Is this seed -

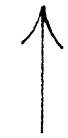
   _____certified _____registered _____foundation

   _____none of the above

10. If not certified, registered, or foundation, number of years away from certification

    _____years _____don't know

Figure 2. Questionnaire



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Figure 3. Illustration of the Numbering Sequence of a Sectionalized Township

The varietal purity of each plot was examined at heading-time when varietal differences first appeared until each plot was completely mature. Varietal purity counts were conducted on ten feet of each of the three inside rows. The outside two rows and 2.5 feet on the ends of each row was discarded to avoid any border effects. Varietal purity was determined by identifying as many "off types" as possible from each plot. Identification of incorrect varieties was based on morphological characteristics, such as height, straw color, and spike characteristics.

The remainder of each two pound sample was taken to the Oklahoma Crop Improvement Association's (O.C.I.A.) laboratory where mechanical analysis was conducted. Each sample was placed through a Precision Divider and weighed into 100-gram and 200-gram working samples. The 100-gram sample was used to determine mechanical purity. The purity test consisted of the following separations: (1) pure seed fraction, (2) other crop seed, (3) weed seed, and (4) inert matter. Each of these four fractions were weighed to the nearest .01 gram. The number of common weed seeds, as determined in the 100-gram sample, was multiplied by five in order to record the number of common weed seeds on a per pound basis. The 200-gram sample was used to determine the number of noxious weed seeds and other crop seeds. The number of noxious weed seed and other crop seed as determined from both the 100 and 200-gram samples was multiplied by 1.67 in order to report their number on a per pound basis.

Germination tests were run on the pure seed fraction. Two 100 seed samples were taken from the pure seed fraction at random. These two samples were placed on water saturated blue-gray germination blotter paper and placed in a Stultz Dalite germinator set at 20° C. These

samples received no artifical light and after seven days germination percentages were calculated.

The mechanical analysis and the varietal purity data were statistically analyzed by county, seed source, and seed type. To obtain a good understanding of the quality of wheat seed, the results of this survey were organized so that multiple comparisons could be made. These comparisons were made by a combination of the following seed types: (1) survey samples, which included all 390 samples collected, (2) survey common samples, which included all survey samples not labeled as either certified, registered, or foundation by the grower (there were 325 common samples), (3) survey pedigreed, which included all survey samples that were labeled certified, registered, or foundation by the producers (there were 65 survey pedigreed samples), (4) O.C.I.A. pedigreed, which included 322 samples of certified, registered, and foundation seed that were sent to the O.C.I.A. laboratory by certified growers throughout the state for the expressed purpose of having them cleared for sale as a certified class of wheat seed (these samples were obtained from the O.C.I.A. and were not included in the 390 samples collected in this survey). Additional comparisons were made with the data obtained by Carlson (3) in a drill box survey he conducted in the fall of 1957.

CHAPTER IV

RESULTS AND DISCUSSION

The data of this study have been presented in several different ways. Comparisons were made between survey samples, survey common samples, survey pedigreed, O.C.I.A. pedigreed, and the 1957 survey (3). In several cases no data were available for O.C.I.A. pedigreed samples or for the 1957 drill box survey. In these cases a dash (-) exists in the tables at the place where this data would have been located.

Source of Seed

The number of samples collected from four seed sources is found in Table II and the source of seed in percent of samples collected in the 16 major wheat producing counties is represented in Table III. Table III lists each county surveyed and the total number of samples collected in that county followed by the percentage of those samples collected from four seed sources. In the lower portion of this table the different seed types are listed. They are: survey average, survey common, survey pedigreed, and O.C.I.A. pedigreed. All 322 O.C.I.A. pedigreed seed samples exceeded certification requirements and are considered as a standard in the determination of wheat seed quality. The O.C.I.A. estimated that the production from 25,378 acres of the 1980 pedigreed wheat crop would be available for sale to the general public in the fall of 1980 for the planting of the 1981 wheat crop (16).

TABLE II

NUMBER OF SAMPLES COLLECTED FROM FOUR SEED SOURCES IN SIXTEEN COUNTIES OF OKLAHOMA

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Total
Alfalfa	4	0	0	10	14
Blaine	3	0	0	14	17
Beaver	10	1	0	20	31
Caddo	4	0	0	15	19
Canadian	2	0	0	25	27
Custer	9	1	1	22	33
Harper	9	1	0	10	20
Jackson	4	4	0	17	25
Kingfisher	8	2	1	23	34
Kiowa	2	1	0	9	12
Major	1	2	0	17	20
Tillman	3	6	0	11	20
Texas	10	0	0	31	41
Washita	9	10	0	18	37
Woods	10	1	0	18	29
Woodward	2	0	0	9	11
Survey Average	90	29	2	269	390
Survey Common	-	-	-	-	325
Survey Pedigreed	-	-	-	-	65
OCIA Pedigreed	-	-	-	-	322
1957 Survey	-	-	-	-	-

TABLE III

SOURCE OF SEED IN PERCENT OF SAMPLES COLLECTED
IN SIXTEEN OKLAHOMA COUNTIES

County	Number of Samples	Source			
		Another Farmer	Seed Dealer	Local Elevator	Farmer's Own
Alfalfa	14	28.6			71.4
Blaine	17	17.7			82.3
Beaver	31	32.3	3.2		64.5
Caddo	19	21.1			79.0
Canadian	27	7.4			92.6
Custer	33	27.3	3.0	3.0	66.7
Harper	20	45.0	5.0		50.0
Jackson	25	16.0	16.0		68.0
Kingfisher	34	23.5	5.9	2.9	57.7
Kiowa	12	16.7	8.3		75.0
Major	20	5.0	10.0		85.0
Tillman	20	15.0	30.0		55.0
Texas	41	24.4			75.6
Washita	37	24.3	27.0		48.7
Woods	29	34.5	3.5		62.1
Woodward	11	18.2			81.8
Survey Average	390	23.1	7.4	0.5	69.0
Survey Common	325	25.2	1.5	0.6	72.6
Survey Pedigreed	65	12.3	36.9	0.0	50.8
OCIA Pedigreed	322	-	-	-	-
1957 Survey	601	21.0	2.0	10.0	66.0

In 1980 the average number of growers planting seed which they produced themselves was 69%, this compares to 66% in 1957 (Table III). Producers obtaining their seed from local elevators accounted for less than one percent of the samples collected. Only 23.1% of the farmers used seed purchased from other farmers and 7.4% used seed from seed dealers. A high of 92.6% of Canadian county farmers planted their own seed while only 48.7% planted their own seed in Washita county. Six of the 16 counties surveyed did not report any seed purchased from dealers. These counties were: Alfalfa, Blaine, Caddo, Canadian, Texas, and Woodward. Counties reporting the highest number of samples originating from seed dealers were Tillman and Washita with 30.0% and 27.0%, respectively.

It was interesting to find over 50% of farmers who were planting certified classes of seed were planting seed they produced themselves (Table III). This indicates a large portion of individuals plant certified classes of seed for their own use as well as for sale to the public.

At the time of sampling each farmer indicated how many acres he would be planting with the lot of seed sampled. When the values were totaled it was found that 168,227 acres were actually sampled in the 16 counties surveyed. This is 4% of the 4,219,000 estimated to be planted in these counties by the Oklahoma Crop and Livestock Reporting Service for the fall of 1980 (17). Table IV indicates that 79.1% or 3.3 million acres were planted with the farmers own seed in these counties. These values are comparable to the 74% found in the 1957 survey. Canadian and Major counties had the highest percentage of acres planted by farmers using their own seed, over 96%. Even though Tillman county farmers with 61% planted the lowest percent of acres in this category, they planted nearly 25% to seed obtained from a seed dealer, the highest of all counties.

TABLE IV

SOURCE OF SEED IN PERCENT OF ACRES PLANTED
IN SIXTEEN OKLAHOMA COUNTIES

County	Source			
	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own
Alfalfa	31.1			68.9
Blaine	8.1			91.9
Beaver	26.5	0.1		73.3
Caddo	12.1			87.9
Canadian	3.1			96.9
Custer	22.0	7.2	0.3	70.5
Harper	23.6	9.6		66.8
Jackson	8.0	9.0		83.0
Kingfisher	8.0	2.5	0.6	88.9
Kiowa	2.2	6.9		90.9
Major	2.9	0.6		96.5
Tillman	14.1	24.9		61.0
Texas	17.9			82.2
Washita	13.2	24.2		62.7
Woods	26.5	2.8		70.7
Woodward	13.1			86.9
Survey Average	15.7	5.1	0.1	79.1
Survey Common	16.4	1.5	0.1	82.0
Survey Pedigreed	10.5	32.3	0.0	57.2
OCIA Pedigreed	-	-	-	-
1957 Survey	16.0	7.0	2.0	74.0

The only two counties that reported acres planted by seed obtained from elevators were Custer and Kingfisher, both of which planted less than one percent of their total acreage with seed of this source. There were no apparent changes in percent of acres planted by any of the four sources from 1957 to 1980 (Table IV).

Seeding Rates

The traditional motto, "plant a bushel per acre", proved to be the philosophy of many farmers. One hundred seventeen growers reported this seeding rate, which accounted for 30% of all farmers. The counties in the extreme northwest part of the state (Texas, Beaver, and Harper) had the lowest average seeding rates, 46.0, 41.1, and 44.6 pounds per acre, respectively (Table V). The remaining 13 counties had seeding rates ranging from 52.2 in Woodward to 82.9 in Canadian. Seeding rates in relation to the source of seed were nearly identical except for seed purchased at elevators. This seed was planted at an average rate of 75 pounds to the acre.

More variability was noted in seeding rates among varieties than among counties (Table VI). In this table the counties are abbreviated as follows: Alfalfa (AL), Blaine (BL), Beaver (BV), Caddo (CD), Canadian (CN), Custer (CU), Harper (HP), Jackson (JK), Kingfisher (KK), Kiowa (KW), Major (MA), Tillman (TL), Texas (TX), Washita (WA), Woods (WD), and Woodward (WW). A sample of Centurk wheat in Texas county was planted at 24 pounds to the acre while a sample of Triumph 64 wheat was planted at the 120 pound rate in Washita county. This is a difference of 96 pounds per acre. In addition, Triumph 64, a variety with a low tillering capacity, was also found to be planted at a rate of 28 pounds

TABLE V

AVERAGE SEEDING RATE IN POUNDS PER ACRE OF FOUR SEED SOURCES WITHIN THE SURVEYED COUNTIES

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	60.0			58.5	58.9
Blaine	80.0			69.3	71.2
Beaver	45.8	45.0		38.6	41.1
Caddo	85.0			77.9	79.4
Canadian	82.5			82.9	82.9
Custer	75.8	65.0	70.0	68.3	70.3
Harper	46.2	50.0		42.5	44.6
Jackson	60.5	61.3		64.4	63.3
Kingfisher	66.3	57.5	80.0	70.9	69.1
Kiowa	47.5	52.0		61.1	58.1
Major	60.0	65.0		61.8	62.0
Tillman	61.7	60.8		63.7	62.6
Texas	52.7			43.9	46.0
Washita	76.7	69.4		76.3	74.5
Woods	58.9	55.0		58.7	58.6
Woodward	57.5			57.1	57.2
Survey Average	61.9	62.6	75.0	62.5	62.5
Survey Common	-	-	-	-	61.8
Survey Pedigreed	-	-	-	-	65.8
OCIA Pedigreed	-	-	-	-	-
1957 Survey	-	-	-	-	55.4

TABLE VI

AVERAGE SEEDING RATE OF TWENTY-SIX VARIETIES OF WHEAT WITHIN EACH COUNTY SURVEYED IN POUNDS PER ACRE

	County																
Variety[1]	AL	BL	BV	CD	CN	CU	HP	JK	KK	KW	MA	TL	TX	WA	WD	WW	Average
BACA			42														41.7
BLUEJACKET			35														35.0
CENTURK													32				32.0
CONCHO								80									80.0
CAPROCK										60							60.0
DANNE			30			60	40		79				35	90	50	47	54.5
EAGLE							45				60						49.7
KAW													28				28.0
MONARCH												55					55.0
NEWTON	60	70		80			49						30		69	65	59.5
OSAGE		80	41			70	43	65		60	70	70					55.1
PALO DURO													40				40.0
PAYNE				90				61		48		66			60	60	62.6
PARKER															58		58.0
RALL																70	70.0
SAGE			39				50								60		42.6
SCOUT			39							60	60		37	68			41.8
STURDY			60	60	78			54				64					65.0
TRIUMPH 64	60	68		80	84	70		59	70			60	29	77	60	45	69.8
TAM W 101	56	70	46	78	85	72		64	67	61	62	58	63	75	60	53	67.4
TAM 105											60			60			60.0
VONA	60	75	60	82	79	69	45	68	70	60	62	62	60	70	57	56	64.9
WICHITA			41				40										40.7
WINGS									60				30		60	60	52.5
"MIXTURE"[2]						80	55			60			30				61.0
"UNKNOWN"[2]				90					80				48				66.3
Average	58.9	71.2	41.1	79.4	82.9	70.3	44.6	63.3	69.2	58.1	62.0	62.6	46.0	74.5	68.6	57.2	62.5

[1] See text for explanation of county abbreviations.

[2] Designated as a mixture of varieties or as an unknown variety, respectively.

per acre in Texas county. Concho, which is considered to be a high tillering variety, was found to be sown at 80 pounds to the acre, nearly 20 pounds above the 16 county average.

Use of Certified Seed

Before the results of certified seed usage is discussed, a description of this seed type is in order. This description comes from Oklahoma's Seed Certification Standards and Rules as set forth by the Oklahoma Crop Improvement Association (15).

> Seed certification is a program which involves the verification of varietal identity and purity based upon the description provided by the plant breeder. It further involves the use of seed production and processing standards in combination with a system of record keeping, field inspections and seed analysis. Seed certification documents provide a guarantee of the product developed by the plant breeder's researches. Certified seed, therefore, is generally recognized as seed of known genetic identity and quality verified by and traceable through the periodic inspection and records of an impartial and officially recognized agency.
>
> The purpose of seed certification is to maintain and make available to the public, high quality seed and propagating materials of adapted superior crop plant varieties grown and distributed to insure varietal identity and purity (p. 3).

The requirements of certified wheat seed that are pertinent to this survey are: (1) field standards, and (2) seed standards. These standards are illustrated in Tables VII and VIII.

Of all acres surveyed, 7.9% were planted to certified seed, as illustrated in Table IX. This acreage was planted by 10.5% of the growers. These values are somewhat higher than those observed in 1957. This may be due to the fact that several of the counties sampled in 1957 were not major wheat producing counties. For instance, in 1980 Nowata and Pawnee counties combined planted only 36 thousand acres to wheat. In comparison, this survey sampled only those counties where wheat was

TABLE VII

FIELD STANDARDS FOR CERTIFIED CLASSES OF WHEAT[1]

Factor	Maximum Permitted in Each Class		
	Foundation	Registered	Certified
Other varieties (maximum)	1:3,000 heads	1:2,000 heads	1:1,000 heads
Inseparable other crops (maximum)[2]	1:10,000 heads	1:10,000 heads	1:2,000 heads
Objectionable weeds whose seed are inseparable (maximum)[3]	NONE	NONE	NONE

[1] From Oklahoma Seed Certification Standards and Rules (15).

[2] Inseparable other crops shall include crop plants, the seed of which cannot be thoroughly removed by the usual methods of cleaning. Rye in winter wheat and barley in oats are well known examples. No rye is permitted in wheat.

[3] Noxious weeds, seeds of which are inseparable, must be destroyed roguing or mowing before field inspection is made. Fields containing field bindweed shall be rejected in all cases.

TABLE VIII

SEED STANDARDS OF CERTIFIED CLASSES OF WHEAT[1]

Factor	Standards for Each Class		
	Foundation	Registered	Certified
Pure Seed (minimum)	96.00%	96.00%	96.00%
Inert matter (maximum)[2]	4.00%	4.00%	4.00%
Objectionable Weeds (maximum)[3]	None	None	None
Total Other Crop Seeds (maximum)	0.06%	0.12%	0.25%
Other Varieties (maximum)	0.05%	0.10%	0.20%
Other Kinds (maximum)[4]	0.01%	0.02%	0.05%
Germination (minimum)	85.00%	85.00%	85.00%
Diseases[5]	--	--	--

[1] From Oklahoma Seed Certification Standards and Rules (15).

[2] Wheat shall not contain more than 2% inert matter other than broken seed.

[3] Texas blueweed, (Helianthus ciliaris), dock (Rumex spp.), hedge bindweed (Convolvulus sepium), and wild oat (Avena fatua). One seed per pound maximum allowable for cheat (Bromus secalinus), corncockle (Agrostemma githago), wild mustard (Brassica kaber), morning glory (Ipomoea spp.), wild buckwheat (Polygonum convolvulus), horsenettle (solanum carolinense), and jointed goatgrass (Aegilops cylindrica).

[4] No rye permitted in wheat. For other small grains the maximum of 1 per pound in Foundation, 2 per pound in Registered, and 5 per pound in Certified must not be exceeded.

[5] If chemically controlled see-borne diseases are noted upon field inspection or laboratory observation, seed treatment is required.

of major economic importance; each county planted over 150 thousand acres. The higher than expected average number of growers and acres (16.7% and 11.7%, respectively) planting pedigreed seed indicates the importance of wheat production in these counties (Table IX). No attempt was made to verify the farmers claim that he was planting a certified class of seed. In Harper county 5.0% of the growers purchased seed from seed dealers (Table III). Table IX shows that 5.0% also grew certified seed. This relationship was not consistent throughout the survey because some growers considered another farmer from whom they purchased their seed wheat to be a seed dealer while others did not.

Varieties

A wide spectrum of wheat varieties are grown in Oklahoma. Table X shows the correctly labeled varieties (as determined by the varietal purity tests) that were grown in the 16 counties surveyed. The varieties grown in 1980 differed greatly from those grown in 1957. The three most popular varieties in 1957 were Triumph 64, Wichita, and Concho (3). Over 92% of the 1957 acreage was dedicated to these three varieties, Triumph 64 accounted for 70.1% alone. Of all 14 varieties grown in the 1957 survey, Triumph 64, Wichita, and Concho were the only ones still being used in 1980. Triumph 64 seemed to pass the test of time, as it still ranked in the top three most popular varieties.

As seen in Table X, more acres were planted to Vona than any other variety in 1980. It accounted for nearly one-fourth of the total acreage. Over 71% of the total acreage was planted with either Vona, Tam W 101, and Triumph 64. Only 40 acres or .03% of the total was planted to Monarch.

TABLE IX

USE OF CERTIFIED WHEAT IN PERCENT OF GROWERS AND ACRES SAMPLED

County	Number of Samples	Growers	Acres
Alfalfa	14	0.0	0.0
Blaine	17	5.9	2.3
Beaver	31	0.0	0.0
Caddo	19	21.1	13.3
Canadian	27	7.4	6.3
Custer	33	0.0	0.0
Harper	20	5.0	12.8
Jackson	25	32.0	15.5
Kingfisher	34	11.8	5.7
Kiowa	12	25.0	14.0
Major	20	0.0	0.0
Tillman	20	20.0	24.9
Texas	41	2.4	2.8
Washita	37	16.2	17.5
Woods	29	20.7	24.3
Woodward	11	9.1	7.3
Certified Average	41	10.5	7.9
Survey Pedigreed	65	16.7	11.7
1957 Certified Average	-	2.8	3.1

TABLE X

PERCENT OF ACRES PLANTED TO EACH CORRECTLY LABELED VARIETY IN THE SIXTEEN COUNTIES SURVEYED AND IN THE 1957 SURVEY

Variety	1980	1957
Apache	-	0.7
Baca	0.9	-
Caprock	1.0	-
Centurk	0.2	-
Cheyenne	-	0.3
Comanche	-	1.2
Concho	0.2	6.6
Crockett	-	0.3
Danne	2.4	-
Eagle	0.3	-
Kanking	-	0.1
Kaw	0.2	-
Kiowa	-	0.6
Monarch	0.02	-
Newton	1.2	-
Osage	3.8	-
Palo Duro	0.9	-
Pawnee	-	-
Payne	1.4	-
Ponca	-	0.5
Pioneer	-	0.1
Rall	0.1	-
Red Chief	-	0.3
Sage	2.2	-
Scout	8.2	-
Sturdy	1.4	-
Triumph 64	18.9	70.1
TAM W 101	22.4	-
TAM 105	0.1	-
Vona	23.0	-
Wichita	0.2	15.6
Wings	0.9	-
Westar	-	1.5
Mislabeled[1]	9.8	-
Mixture[2]	0.6	-
Unknown[3]	0.4	1.4

[1] Farmer mislabeled the variety.
[2] Labeled by farmer as a "mixture of varieties".
[3] Labeled by farmers as an "unknown" variety.

A special note needs to be made for several varieties. There are very few visual differences between the varieties Scout and Scout 66 because Scout 66 is a selection from Scout. Therefore, the data of the samples labeled by these two varieties were combined. Likewise, the samples labeled Triumph, Triumph 64, Improved Triumph, and Early Triumph were considered as one variety, Triumph 64 in 1980 but not in the 1957 survey.

Tables XI shows that 14% of the farmers were planting varieties that were either mislabeled, or of unknown identity, or varieties that were labeled as a mixture of types. Using these percentages, of the 16 counties surveyed, an estimated 185,000 acres were planted with seed from these three categories.

An unusually high proportion of Major county growers, 35%, incorrectly labeled the varietal name of their seed. As will be shown later, Major county planted some of the poorest quality seed sampled in this survey. Caddo county had the lowest proportion of growers mislabeling their seed with 5.3%.

Table XII, which lists acreage percentages of the wheat varieties collected by county, shows Vona as being the only variety planted in every county. TAM W 101 and Triumph 64 were found in 15 and 12 of the 16 counties sampled, respectively. Washita county had the highest proportion of acres planted to one variety, Triumph 64, at 58%. Remaining varieties were found in no more than nine counties each.

Varietal Purity

There are several methods available for determination of varietal purity. One is the phenol test. For this test, 100 seeds are taken

TABLE XI

PERCENT OF GROWERS PLANTING MISLABELED, UNKNOWN OR A MIXTURE OF VARIETIES

County	Number of Samples	Mislabeled	Unknown	Mixtures
Alfalfa	14	14.3		7.1
Blaine	17	5.9		
Beaver	31	12.9		
Caddo	19	5.3		
Canadian	27	7.4		
Custer	33	9.1	6.1	
Harper	20	20.0	5.0	
Jackson	25	16.0		
Kingfisher	34	8.8		2.9
Kiowa	12	8.3	8.3	
Major	20	35.0		
Tillman	20	10.0		
Texas	41	9.8	2.4	4.9
Washita	37	5.4		
Woods	29	17.2		
Woodward	11	9.1		
Total	390	11.8	1.0	1.3

TABLE XII

ACREAGE PERCENTAGES OF THE WHEAT VARIETIES COLLECTED WITHIN EACH COUNTY SURVEYED

Variety	AL	BL	BU	CD	CN	CU	HP	JK	KK	KW	MA	TL	TX	WA	WD	WW
Baca			10													
Blue Jacket			3													
Centurk													2			
Concho								4								
Caprock										29						
Danne			4			6	12		6				3	2	6	20
Eagle							5				7					
Kaw													2			
Monarch												1				
Newton	4	4		2			10						1		2	
Osage		14	10			1	42	2		1	1	2			16	
Palo Dura												1				
Payne				3				8		7		10		4	4	
Parker														2		
Rall															4	
Sage			16				10							2		
Scout			41						1	3		30	5			
Sturdy			0*	3	6			2			19					
Triumph 64	52	17		6	50	50		12	15			11	6	58	4	15
TAM W 101	27	54	5	45	26	12		54	57	29	55	23	17	20	35	14
TAM 105											0*			2		
Vona	17	12	7	44	14	31	17	17	21	28	34	35	31	12	46	19
Wichita			4				1									
Wings									1				3		3	8
"Mixture"[1]						1	3			4			1			
"Unknown"[2]				3					1				2			

* Value was less than 0.5.

[1] Labeled by farmers as a "mixture" of varieties.

[2] Labeled by farmers as an "unknown" variety.

from the pure seed fraction of the mechanical analysis. The seeds are soaked overnight in water, drained and placed on phenol-saturated filter paper and allowed to stain for approximately two hours. Seeds from different genetic backgrounds will stain to different degrees of darkness, allowing varietal mixtures and mislabeled varieties to be identified. There are, however, some varieties that cannot be differentiated by this method. A list of varieties and the color they stain is located in Appendix A.

The second method of determining varietal purity involves planting a sample of the seed in a field nursery. Identification of "off types" is then made throughout the growing season based upon plant height, straw color, heading date, and morphological chacteristics. For obvious reasons, the second method tends to be more accurate and was employed in assessing varietal purity values to each sample of this survey.

The Rules and Regulations of the Oklahoma Seed Law specifies that the minimum requirements for varietal purity of wheat seed sold in Oklahoma by varietal name must contain at least 90% of the variety named or upon growth shall produce plants having characteristics similar to the variety named (16). If the varietal purity of any lot of seed falls below this minimum it must be labeled as "mixed" or "mixture". The term mixture means seed consisting of more than one kind or variety each present in excess of five percent (5%) of the whole (18). Thus, under the Oklahoma Seed Law, a sample of Newton wheat containing 3.5% Osage, 3.0% Scout, and 3.0% Wings could legally be labeled as Newton wheat. Notice that over 9% of this seed is not Newton.

In contrast, requirements of certified wheat are much more stringent. As seen in Tables VII and VIII, field standards permit no more

than 1 of every 1,000 heads to be of another variety. Moreover, less than 0.20% of the pure seed fraction may be comprised of seeds from other varieties (15).

The number and percent of samples falling into arbitrary divisions of varietal purity are found in Table XIII. Over 79% of survey common wheat samples were above 95% pure, thus, passing Oklahoma Seed Law requirements. Nearly 90% of survey pedigreed samples met the same criteria. Evidently, some of the farmers who reported that they were planting certified classes of seed, which had passed minimum certification standards, were not, as is indicated by 10.7% of the survey pedigreed samples were less than 95% pure. Table XIII shows that over one-half of the samples labeled as a certified class of seed failed to pass the minimum field standards of certified wheat. It should be restated that no verification of the farmers statement that he was planting certified seed was made. All samples labeled as a certified class of seed had an average varietal purity of 99.4% while those labeled as common wheat averaged 86.2%.

All seed obtained from a local elevator was labeled as a varietal mixture or as an unknown variety as is shown by Table XIV. The majority of producers obtaining their seed from another farmer planted seed with a varietal purity above 99%. This was also true of farmers planting their own seed. Seed dealers had the highest proportion of samples over 95% varietally pure with 96.3%. All samples of seed obtained from seed dealers passed varietal purity requirements of the Oklahoma Seed Law except one, as seen in Table XV. Thirty-six samples, or 78.3%, of all incorrectly labeled samples were from farmers planting their own seed. From Tables XIV and XV it can be seen that the highest number of samples

TABLE XIII

THE NUMBER AND PERCENT OF SURVEY COMMON AND SURVEY PEDIGREED SAMPLES WITHIN ARBITRARY VARIETAL PURITY CLASSES

	Survey Common		Survey Pedigreed	
Purity Class	Number of Samples	Percent of Samples	Number of Samples	Percent of Samples
Pure	84	25.8	29	44.6
99.9 - 99.0%	113	34.8	18	27.7
99.0 - 95.0%	60	18.5	11	16.9
95.0 - 90.0%	6	1.8	1	1.5
90.0 - 50.0%	13	4.0	0	0.0
50.0 - 00.0%	40	12.3	6	9.2
Variety Unknown[1]	4	1.2	0	0.0
Variety Mixture[2]	5	1.5	0	0.0
Total	325	100.0	65	100.0

[1] Labeled by farmers as an "unknown" variety.

[2] Labeled by farmers as a "mixture" of varieties.

TABLE XIV

THE PERCENT OF SURVEY SAMPLES FALLING INTO ARBITRARY VARIETAL PURITY CLASSES WITHIN FOUR SEED SOURCES

	Source				
Purity Class	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	% of All Samples
Pure	26.7	41.4	0.0	28.6	29.0
99.9 - 99.0%	35.6	37.9	0.0	32.7	33.6
99.0 - 95.0%	23.3	17.4	0.0	16.7	18.2
95.0 - 90.0%	1.1	0.0	0.0	2.2	1.8
90.0 - 50.0%	0.0	0.0	0.0	4.8	3.3
50.0 - 00.0%	10.0	3.4	0.0	13.4	11.8
Variety Unknown[1]	2.2	0.0	50.0	0.4	1.0
Variety Mixture[2]	1.1	0.0	50.0	1.1	1.3

[1] Labeled by farmers as an "unknown" variety.

[2] Labeled by farmers as a "mixture" of types.

TABLE XV

THE NUMBER OF SURVEY SAMPLES FALLING INTO ARBITRARY VARIETAL PURITY CLASSES WITHIN FOUR SEED SOURCES

	Source				
Purity Class	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Total
Pure	24	12	0	77	113
99.9 - 99.0%	32	11	0	88	131
99.0 - 95.0%	21	5	0	45	71
95.0 - 90.0%	1	0	0	6	7
90.0 - 50.0%	0	0	0	13	13
50.0 - 00.0%	9	1	0	36	46
Variety Unknown[1]	2	0	1	1	4
Variety Mixture[2]	1	0	1	3	5
Total	90	29	2	269	390
% of All Samples	23.1	7.4	0.5	69.0	

[1] Labeled by farmers as an "unknown" variety.

[2] Labeled by farmers as a "mixture" of types.

with varietal purity above 95% was from seed dealers while the lowest number of samples with varietal purities above 95% was from farmers who planted their own seed (except, of course, seed obtained at elevators where no seed was sold by varietal name).

The varietal purity percentage of seed decreased as years from certification increased. This was undoubtedly due to the introduction of contaminates from year to year. From the data collected, and as Table XVI indicates, 44.6% of survey pedigreed seed was pure while over nine percent was mislabeled. If certification seed tags of these pedigreed samples had been collected, verification as to whether or not they actually were certified by the O.C.I.A. could have been made. The average varietal purity percentage of the samples where the number of years away from certification were unknown was 18.3%, the lowest. The column titled "50.0 - 00.0%" in Table XVI shows an increasing percent of farmers mislabeled their varieties as the number of years from certification increased. (For the purpose of this study samples that had greater than 50% varietal impurities were considered as being mislabeled.) On a related subject, all varieties in this study, the year they were released as varieties to the public, and their varietal purity has been recorded and are presented in Table XVII. Of the seven varieties released since 1975, Vona was the only one that reported samples with varietal purities below 95%. TAM 105, the most recently released variety, had 50% of its samples completely free from varietal impurities.

Weed Seed Content

Weed control methods have greatly improved over the past 23 years. In 1957 farmers planted an average of 140 total weed seed per pound of

TABLE XVI

THE PERCENT OF SURVEY SAMPLES WITHIN ARBITRARY VARIETAL PURITY CLASSES CATEGORIZED BY YEARS FROM CERTIFICATION

Years From Certification	Percent Varietal Purity								
	Pure	99.9 to 99.0%	99.0 to 95.0%	95.0 to 90.0%	90.0 to 50.0%	50.0 to 00.0%	Unknown Variety	Variety Mixture	Total
1	37.7	37.7	21.8	0	2.9	0	0	0	69
2	32.1	35.7	16.1	1.8	3.6	8.9	0	1.8	56
3	22.2	35.6	22.2	2.2	6.7	8.9	0	2.2	45
4	21.1	47.4	10.5	5.3	0	15.8	0	0	19
5	25.0	25.0	12.5	0	12.5	25.0	0	0	16
Years Unknown	18.3	31.7	18.3	2.5	3.3	20.0	3.3	2.5	120
Survey Pedigreed	44.6	27.8	16.9	1.5	0	9.2	0	0	65

TABLE XVII

THE YEAR OF RELEASE AND PERCENT OF TWENTY-FOUR VARIETIES WITHIN ARBITRARY VARIETAL PURITY CLASSES

Variety	Year Released	Percent Varietal Purity					
		Pure	99.9 to 99.0%	99.0 to 95.0%	95.0 to 90.0%	90.0 to 50.0%	50.0 to 00.0%
Baca	1973	33.3	33.3	33.3			
Blue Jacket	1947					100.0	
Caprock	1967			100.0		100.0	
Centurk	1971				50.0	50.0	
Concho	1954				100.0		
Danne	1970	18.2	36.4	9.1		36.4	
Eagle	1970	33.3	33.3				33.3
Kaw	1960		100.0				
Newton	1977	37.5	37.5	25			
Osage	1974	12.5	31.3	12.5		37.5	6.3
Palo Duro	1969		100.0				
Parker	1966					100.0	
Payne	1977	23.1	61.5				15.4
Rall	1976			100.0			
Sage	1973	25	50	12.5		12.5	
Scout	1963	29.6	40.7	11.1	3.7	3.7	11.1
Sturdy	1967	22.2	22.2	44.4			11.1
TAM W 101	1972	23.2	38.4	21.4	4.5		12.5
TAM 105	1979	50.0	50.0				
Triumph 64	1964	44.3	28.6	8.6	1.4	4.3	12.9
Vona	1976	37.8	28.0	25.6		1.2	7.3
Wichita	1944					33.3	66.7
Wings	1977		50.0	50.0			

seed planted (Table XVIII). In 1980 an average of only 23 weed seeds per pound of wheat seeded were found. This, however, does not mean that weed seed contamination was a serious problem. Woodward county samples contained an average of 191 weed seed per pound. By multiplying this value by Woodward's average seeding rate, over 10,902 total weed seed were found to be sown per acre. Woodward, along with Alfalfa and Major counties, were found to have significantly more weed seed per pound than the other counties by using Duncan's multiple range test. The O.C.I.A. samples had the lowest average number of weed seeds. There was a highly significant difference between these samples and the survey average.

Seed originating from elevators had the highest average number of weed seed per pound with 96. This value was significantly higher than the other three seed sources. Seed purchased from seed dealers proved to be the highest quality seed with only two weed seeds per pound.

Total weed-seed averages are comprised of two factors, noxious weeds and common weeds. Survey wide, the average producer planted 11 noxious weed seeds per pound of wheat planted (Table XIX). This value was similar to the 12 weed seeds per pound found in 1957 but was significantly higher than the O.C.I.A. samples.

Samples from Alfalfa county contained the highest average number of noxious weed seeds (32 per pound) which was significantly higher than Texas, Tillman, and Beaver counties which each averaged only one noxious weed seed per pound of wheat sown.

Like the average number of total weeds, elevator seed had a significantly higher average number of noxious weeds than the other three sources. Texas, Tillman and Woodward counties reported no contamination

TABLE XVIII

AVERAGE NUMBER OF TOTAL WEEDS PER POUND IN SURVEY SAMPLES WITHIN EACH COUNTY SURVEYED AND CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	3.0			63.2	46.0**
Blaine	.7			4.18	34.5
Beaver	2.7	0.0		21.6	14.8
Caddo	.8			3.1	2.6
Canadian	24.0			32.2	31.6
Custer	.8	0.0	101.0	18.8	15.8
Harper	27.2	0.0		6.2	15.3
Jackson	4.3	3.8		36.9	26.4
Kingfisher	30.2	0.0	90.0	14.8	19.8
Kiowa	1.0	0.0		12.8	9.8
Major	378.0	0.0		45.8	57.8**
Tillman	1.7	3.4		28.5	18.8
Texas	.5			7.9	6.1
Washita	30.4	2.5		10.0	12.9
Woods	4.1	0.0		6.7	5.6
Woodward	2.5			232.4	190.6**
Survey Average	16.0	2.1	95.5*	26.6	22.7
Survey Common	-	-	-	-	28.0
Survey Pedigreed	-	-	-	-	1.8
OCIA Pedigreed	-	-	-	-	0.1**
1957 Survey	-	-	-	-	140.4

*Indicates significantly higher than seed dealers at .05 significance level

**Indicates significantly higher than Beaver, Texas, Caddo county averages and OCIA Pedigreed average at .01 significance level

***Indicates significantly lower than survey average at .01 significance level

TABLE XIX

AVERAGE NUMBER OF NOXIOUS WEED SEEDS PER POUND IN SURVEY SAMPLES WITHIN EACH COUNTY SURVEYED CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	3.0			44.2	32.4
Blaine	0.7			3.2	2.8
Beaver	0.7	0.0		1.6	1.3**
Caddo	0.8			1.5	1.4**
Canadian	24.0			23.4	23.4
Custer	0.8	0.0	56.0	17.6	13.7
Harper	14.4	0.0		1.2	7.1
Jackson	0.5	0.0		17.5	12.0
Kingfisher	27.8	0.0	75.0	14.1	18.3
Kiowa	1.0	0.0		9.4	7.3
Major	113.0	0.0		22.9	25.1
Tillman	0.0	0.3		1.7	1.1**
Texas	0.0			1.5	1.1**
Washita	24.9	2.0		7.5	10.2
Woods	3.1	0.0		6.4	5.1
Woodward	0.0			31.4	25.7
Survey Average	8.9	0.8	65.5*	12.0	10.7***
Survey Common	-	-	-	-	12.6
Survey Pedigreed	-	-	-	-	1.4
OCIA Pedigreed	-	-	-	-	0.0**
1957 Survey	-	-	-	-	12.0

*Indicates significantly higher than other three seed sources at .05 significance level

**Indicates significantly lower than Alfalfa county average at .01 significance level

***Indicates significantly higher than OCIA Pedigreed at .01 significance level

of noxious weed seed in wheat purchased from other farmers. Seed obtained from seed dealers proved to be very low in average number of noxious weeds per pound. Noxious weed seeds were found to contaminate seed obtained from seed dealers in only two counties, Tillman and Washita.

On the average, growing survey pedigreed seed contained 11 less noxious weed seeds per pound than common wheat (Table XIX). In addition, survey pedigreed seed contained approximately 15 less common weed seeds per pound (Table XX). The highest number of common weed seed per pound (165) was found in Woodward county, which was significantly higher than the remaining 15 counties. Woods county samples contained had the lowest weed seed count with less than three per pound.

Survey pedigreed samples and O.C.I.A. samples both contained an average of less than one common weed seed per pound and were both significantly lower than the survey common and the survey average.

Even though an average of 30 common weed seeds were found in samples originating from elevators, this difference was not statistically different from the other three sources. There was only one sample collected in Major county which originated from another farmer. This sample had an average of 265 common weed seeds per pound. By using the farmer's seeding rate it was found that 15,900 common weed seeds were being sown per acre.

A list of all common and noxious weeds found in this survey may be found in Appendix B.

Other Crop Seed

The 16 county average indicated that the average farmer planted

TABLE XX

AVERAGE NUMBER OF COMMON WEEDS PER POUND IN SURVEY SAMPLES WITHIN EACH COUNTY SURVEYED CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	0.0			19.0	13.6
Blaine	0.0			38.6	31.8
Beaver	2.0	0.0		20.0	13.6
Caddo	0.0			1.7	1.3
Canadian	0.0			8.8	8.2
Custer	0.0	0.0	45.0	1.2	2.1
Harper	12.8	0.0		5.0	8.3
Jackson	3.8	3.8		19.4	25.3
Kingfisher	2.5	0.0	15.0	0.7	1.5
Kiowa	0.0	0.0		3.4	2.5
Major	265.0	0.0		22.9	32.8
Tillman	1.7	3.4		26.8	16.0
Texas	0.5			6.5	5.0
Washita	5.5	0.5		2.5	2.7
Woods	1.0	0.0		0.3	0.5
Woodward	2.5			20.1	165.0**
Survey Average	5.7	1.4	30.0	17.0	13.3
Survey Common					15.4
Survey Pedigreed					0.5
OCIA Pedigreed					0.1*
1957 Survey					128.4

*Indicates significantly lower than survey average at .01 significance level

**Indicates significantly higher than survey average than all other counties at the .01 significance level

three seeds of other crops per pound of wheat sown (Table XXI). The source with the highest average contamination of other crop seed was local elevators with an average of 19 per pound. The farmer's own seed, which had an average of five per pound, was second followed by another farmer's seed with two, and seed from dealers with only 0.2 other crop seeds per pound. Seed of crops other than wheat was found in samples from all seed sources, but seed obtained from seed dealers had the lowest contamination of other crop seed. Of the 10 counties reporting seed sold by seed dealers, seven counties did not have any samples contaminated with other crop seed. Each of the three counties where other crop seed was found in seed obtained from seed dealers, less than one seed per pound was noted.

Samples from Blaine and Harper counties had the highest incidence of other crop seed (Table XXI). These two counties averaged 12 and 10 other crop seeds per pound of wheat sown. Barley was the predominate other crop found in these two counties. Seven of the counties surveyed averaged less than one other crop seeds per pound; Beaver, Caddo, Jackson, Kingfisher, Kiowa, Major and Woods.

Certified classes of wheat had an average of 0.5 other crop seeds per pound while common wheat was contaminated with 3 per pound. In 1957 the average farmer planted seed contaminated with 29 other crop seeds per pound. This compares to less than three in 1980. Obviously the lower occurrence of other crop seed in 1980 indicated higher quality seed was planted in 1980 when compared to 1957. A list of the other crop seeds found in this survey can be found in Appendix B.

Cleaned Seed

The occurrence of impurities such as noxious weeds, common weeds,

TABLE XXI

AVERAGE NUMBER OF OTHER CROP SEED PER POUND
IN SURVEY SAMPLES WITHIN EACH COUNTY
CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	2.8			0.7	1.3
Blaine	1.3			11.7	9.9
Beaver	0.3	0.0		0.7	0.6
Caddo	0.0			0.5	0.4
Canadian	1.5			0.7	0.7
Custer	3.7	0.0	22.0	1.6	2.7
Harper	12.3	0.0		10.2	10.7
Jackson	0.0	0.0		1.0	0.7
Kingfisher	0.0	0.0	16.0	0.6	0.9
Kiowa	1.0	0.0		0.2	0.3
Major	0.0	0.5		0.4	0.4
Tillman	0.0	0.3		8.0	4.5
Texas	0.4			8.7	6.7
Washita	0.0	0.3		0.4	0.3
Woods	0.0	0.0		0.2	0.1
Woodward	0.0			7.1	5.8
Survey Average	1.9	0.2	19.0	3.0	2.6
Survey Common	-	-	-	-	3.1
Survey Pedigreed	-	-	-	-	0.5
OCIA Pedigreed	-	-	-	-	0.1
1957 Survey	-	-	-	-	29.0

and inert matter can be reduced with proper cleaning methods. As illustrated in Table XXII, the average mechanical purity percentage of uncleaned seed was 97.44%, for cleaned seed, 98.16%. Inert matter percentages were 2.52% and 1.83% for uncleaned and cleaned seed, respectively. Cleaned and uncleaned seed contained 8 and 11 noxious weed seeds per pound, respectively, while the occurrence of common weeds was 1 and 15 per pound, respectively.

None of the samples from Alfalfa county farmers had been cleaned (Table XXIII). In contrast, 88.9% of the seed sampled in Canadian county was cleaned prior to planting. Alfalfa county farmers planted seed contaminated with 46 total weed seeds per pound, 32 of which were noxious (Tables XVIII and XIX). Only 25% of Major county farmers planted cleaned seed (Table XVIII). Of the 35% of Major county farmers who mislabeled the variety of the wheat they were sowing (Table IX), none of the mislabeled seed had been cleaned. In addition, Alfalfa and Major counties were two of the four counties where the survey detected no use of certified seed (Table IX). The most beneficial effect of cleaning was found in Harper county, where samples of cleaned seed contained less than one noxious weed seed per pound but uncleaned samples contained 26 noxious weed seeds per pound, over twice the survey average.

Even though cleaned seed in almost every case contained less weed seed than uncleaned seed, exceptions were found. In Kiowa county cleaned seed averaged 11 more total weed seeds per pound than uncleaned seed.

All of the seed obtained from elevators was cleaned while 80% of seed obtained from seed dealers was cleaned (Table XXIII). Farmers cleaned 60% of the seed they produced themselves and 54% of the seed purchased from neighbors was cleaned. Although all of the seed purchased

TABLE XXII

AVERAGE PERCENT PURITY AND INERT MATTER AND AVERAGE NUMBER OF NOXIOUS AND COMMON WEEDS PER POUND FOR SIXTEEN OKLAHOMA COUNTIES

	Cleaned	Uncleaned
Purity (%)	98.16*	97.44
Inert Matter (%)	1.83**	2.52
Noxious Weeds (number/lb.)	8	11
Common Weeds (number/lb.)	1	15
Total Weeds (number/lb.)	9	26

*Indicates significantly higher than uncleaned at the .01 significance level

**Indicates significantly lower than uncleaned at the .01 significance level

TABLE XXIII

PERCENT OF GROWERS PLANTING CLEANED SEED WITHIN EACH COUNTY SURVEYED CATEGORIZED BY SEED SOURCE

	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	0.0			0.0	0.0
Blaine	100.0			71.4	76.5
Beaver	30.0	100.0		30.0	32.3
Caddo	25.0			66.7	57.9
Canadian	100.0			88.0	88.9
Custer	88.9	100.0	100.0	77.2	81.8
Harper	44.4	100.0		100.0	75.0
Jackson	75.0	100.0		47.1	60.0
Kingfisher	37.5	50.0	100.0	78.3	67.7
Kiowa	50.0	100.0		88.9	83.3
Major	0.0	100.0		17.7	25.0
Tillman	100.0	83.3		54.6	70.0
Texas	40.0			35.5	36.6
Washita	66.7	80.0		83.3	78.4
Woods	60.0	100.0		66.7	65.5
Woodward	100.0			66.7	72.7
Survey Average	54.4	86.2	100.0	60.2	61.0
Survey Common	-	-	-	-	56.9
Survey Pedigreed	-	-	-	-	81.5
OCIA Pedigreed	-	-	-	-	87.3
1957 Survey	-	-	-	-	66.6

from elevators was cleaned, it still contained an average of 96 weed seeds per pound, far more than any other seed source (Table XXIII).

Treated Seed

Appendix C presents the percent of growers planting seed treated with fungicides. Treating seed was a popular practice of dealers throughout the survey but a relatively low proportion of growers planting another's seed and growers planting their own seed treated with fungicides. Fungicides were not used widely in the northwest part of the state (Alfalfa, Beaver, Harper and Texas counties) probably because fungus is not a serious problem in more arid areas. Since O.C.I.A. does not normally analyze treated seed, only a small portion of these samples were found to be treated. Most of O.C.I.A. wheat is treated after clearing the standards for pedigreed seed.

The percentage of growers planting seed treated with insecticide is presented in Appendix D. In general, very few farmers plant seed treated with insecticides. This may be because most seed wheat is from the previous years crop, and thus was only in storage three or four months, generally, not enough time for major insect problems to occur. Only seven percent of the samples collected had been treated with an insecticide. More seed originating from seed dealers was found to be treated than from the other sources. Seed dealers treated an average of 17% of their commodity with insecticides.

In 1957, 45% of the farmers surveyed planted seed treated with pesticides while only 38% of the farmers treated with pesticides in 1980. The 1957 survey did not report fungicide treated and insecticide treated data separately.

There were no samples from Alfalfa, Blain, Beaver, Harper, Texas and Woodward counties that had been laboratory tested for quality prior to planting (Table XXIV). Table XIX shows that two of those counties, Alfalfa and Woodward, had the highest contamination of noxious weeds of all counties surveyed. Surely, these farmers would not have planted this seed if they had known if contained high quantities of noxious weed seeds. Another comparison, between Tables XXIV and XX, shows that laboratory tested seed was higher in quality than seed not tested. Washita county, which had the highest percent of producers planting lab tested seed (32%), planted only 3 common weed seeds per pound of wheat planted, which is less than one-fourth of the 16 county average.

Seed dealers are required by the Oklahoma Seed Law to have their seed laboratory tested prior to sale. Table XXIV shows that, even though seed dealers had the highest percentage of their samples laboratory tested, nearly 45% of them did not. This suggests that nearly 45% of the seed dealers surveyed were farmers who sold seed to nearby neighbors. Table XIX shows that 66 noxious weed seeds per pound were planted by growers using elevator run seed. Using the average seeding rate for this source of seed (Table V) over 4,900 noxious weed seeds per acre were sown by growers using seed obtained from elevators.

Mechanical Purity and Inert Matter Percentages

Definitions of purity, inert matter, other crop seed, and weed seed are presented in Appendix E. Tillman county, which had 70% of its seed cleaned (Table XXIII), planted the lowest number of noxious weed seeds per pound of all counties surveyed (Table XIX), seeded a higher percentage of acres surveyed to certified seed (Table IX), and had the highest

TABLE XXIV

PERCENT OF GROWERS PLANTING LABORATORY TESTED SEED WITHIN EACH COUNTY SURVEYED AND CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	0.0			0.0	0.0
Blaine	0.0			0.0	0.0
Beaver	0.0	0.0	0.0	0.0	0.0
Caddo	0.0			13.3	10.5
Canadian	50.0			12.0	14.8
Custer	0.0	100.0	0.0	4.6	6.1
Harper	0.0	0.0		0.0	0.0
Jackson	0.0	50.0		5.9	12.0
Kingfisher	12.5	50.0	0.0	4.4	8.8
Kiowa	0.0	100.0		11.1	16.7
Major	0.0	100.0		0.0	10.0
Tillman	0.0	16.7		9.1	10.0
Texas	0.0			0.0	0.0
Washita	22.2	70.0		16.7	32.4
Woods	20.0	100.0		11.1	17.2
Woodward	0.0			0.0	0.0
Survey Average	6.7	55.2	0.0	5.6	9.5
Survey Common	-	-	-	-	2.8
Survey Pedigreed	-	-	-	-	43.1
OCIA Pedigreed	-	-	-	-	100.0
1957 Survey	-	-	-	-	-

mechanical purity with 98.71% (Table XXV). Texas county had an average purity of 95.82%. This value falls below the standards of all three certified classes of wheat seed (Table VIII). Only seed obtained from elevators in Custer county and seed obtained from other farmers in Alfalfa county had a lower mechanical purity than the Texas county average (Table XXV). Since percent inert matter is largely a function of the mechanical purity percentage, it is seen from Table XXVI that these three sources of seed were also higher in percent inert matter with 4.12%, 5.42%, and 5.12%, respectively. Tillman county had the lowest percent inert matter with 1.29%.

Seed purchased from seed dealers had a higher average mechanical purity and a lower average inert matter content than seed from other farmers, elevators and seed from growers producing their own seed (Tables XXV and XXVI). All the seed obtained from elevators in Custer county had been cleaned yet contained over 5.40% inert matter (Tables XXIII and XXVI). This indicates very poor cleaning methods were used.

Seed labeled as being a certified class of wheat had a significantly lower inert matter content than both survey common samples and the 16 county average (Table XXVI). Inert matter percentage of the O.C.I.A. samples was found to be even less than the thesis pedigreed samples; 1.23% compared to 1.77%. Referring back to Table XXIV, the same relationship existed between mechanical purity percentages, O.C.I.A. pedigreed had an average of 98.76% while survey pedigreed samples averaged 98.17%.

Both purity and inert matter percentages were nearly the same as the 1957 averages. In 1980 mechanical purity was found to be 0.49% lower and inert matter was 0.60% higher than their corresponding values in 1957.

TABLE XXV

AVERAGE PERCENT PURITY OF SAMPLES FROM SIXTEEN OKLAHOMA COUNTIES CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	94.86			96.53	96.05**
Blaine	98.47			97.70	97.83
Beaver	95.36	98.70		96.53	96.22**
Caddo	97.72			97.97	97.92
Canadian	99.19			98.52	98.57
Custer	98.23	98.59	94.42	98.27	98.16
Harper	96.32	98.69		97.84	97.20
Jackson	98.79	99.32		98.25	98.51
Kingfisher	98.11	98.92	97.48	98.21	98.21
Kiowa	98.55	98.94		97.87	98.07
Major	96.25	98.17		97.87	97.82
Tillman	99.20	99.30		98.25	98.71
Texas	97.23			95.36	95.82**
Washita	97.58	97.71		98.41	98.02
Woods	97.04	96.71		96.69	96.81**
Woodward	95.40			96.72	96.48**
Survey Average	97.24	98.48*	95.95	97.51	97.51
Survey Common	-	-	-	-	97.37
Survey Pedigreed	-	-	-	-	98.17
OCIA Pedigreed	-	-	-	-	98.76***
1957 Survey	-	-	-	-	98.00

*Indicates significantly higher than other three sources at the .05 significance level

**Indicates significantly lower than OCIA Pedigree average and Tillman and Canadian county averages at the .01 significance level

***Indicates significantly higher than survey average at the .01 significance level

TABLE XXVI

AVERAGE PERCENT INERT MATTER OF SAMPLES FROM SIXTEEN OKLAHOMA COUNTIES CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	5.12			3.40	3.89
Blaine	1.52			2.25	2.12**
Beaver	4.64	1.30		3.60	3.86
Caddo	2.28			2.02	2.07**
Canadian	0.78			1.33	1.29**
Custer	1.75	1.41	5.42	1.70	1.82**
Harper	3.52	1.31		2.04	2.67**
Jackson	1.21	.69		1.69	1.45**
Kingfisher	1.80	1.08	2.26	1.77	1.75**
Kiowa	1.45	1.06		2.12	1.92**
Major	3.75	1.83		2.09	2.15**
Tillman	0.79	0.70		1.74	1.29**
Texas	2.77			4.56	4.12
Washita	2.38	2.28		1.57	1.96**
Woods	2.95	3.29		3.30	3.18
Woodward	4.60			3.23	3.48
Survey Average	2.73	1.51	3.84	2.45	2.45***
Survey Common	-	-	-	-	2.59
Survey Pedigreed	-	-	-	-	1.77*
OCIA Pedigreed	-	-	-	-	1.23**
1957 Survey	-	-	-	-	1.85

*Indicates significantly lower than survey common average at the .05 significance level
**Woodward county averages at the .01 level of significance
***Indicates significantly higher than OCIA Pedigreed at the .01 significance level

TABLE XXVII

AVERAGE GERMINATION RATE OF SAMPLES FROM SIXTEEN OKLAHOMA COUNTIES CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	95.88			94.70	95.04
Blaine	94.67			94.61	94.62
Beaver	93.65	93.00		95.98	95.13
Caddo	97.25			91.17	92.45
Canadian	95.50			95.58	95.57
Custer	95.33	94.50	91.00	96.66	96.06
Harper	95.00	97.00		95.39	95.28
Jackson	98.25	96.98		94.79	95.70
Kingfisher	96.63	93.25	96.50	96.22	96.15
Kiowa	98.50	98.00		96.06	96.63
Major	95.00	91.50		94.44	94.18
Tillman	96.33	95.65		96.32	96.27
Texas	96.30			95.52	95.71
Washita	94.00	95.30		96.61	95.62
Woods	95.35	95.50		93.44	94.17
Woodward	93.50			94.00	93.91
Survey Average	95.52	95.25	93.75	95.20	95.27
Survey Common	-	-	-	-	95.17
Survey Pedigreed	-	-	-	-	95.80
OCIA Pedigreed	-	-	-	-	95.33
1957 Survey	-	-	-	-	88.50

The last analysis conducted was germination percentages (Table XXVII). The survey average recorded by Carlson in 1957 was 88.5%. Considering that the large majority, if not all, of the seed planted in 1980 was harvested in the summer of the same year, the 95.3% germination rate is higher than expected due to the drought in the spring which caused most of the samples collected to be shriveled.

Seed samples from Kiowa county had a germination rate of 96.63%, the highest of all counties (Table XXVII). Within this county, seed purchased from another farmer had the highest germination rate with 98.50%. The county with the lowest germination rate was Caddo with 92.45%. Caddo county also recorded the individual sample germinating the lowest. A farmer who was using his own seed planted 160 acres with seed that germinated only 30%.

The average germination rate of all three seed sources was above 94%. In general, seed germination rates were quite high.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was designed to sample the wheat seed in the 22 major wheat producing counties of Oklahoma. Technical difficulties prevented the collection of samples in six of these counties so the data from 16 were analyzed and are presented in this paper. Samples were collected from randomly selected sections within the townships of each of these counties.

Wheat seed quality was determined by comparing the results of the mechanical purity tests, germination tests, and varietal purity tests. Comparisons made were between seed sources, seed types, and cleaned versus uncleaned seed. The seed sources included seed obtained from another farmer, a seed dealer, a local elevator and seed that had been produced by the farmer himself. The seed types were survey average, survey common, survey pedigreed, O.C.I.A. pedigreed, and the results of a drill box survey conducted in 1957 (3). Sixty-nine percent of the farmers surveyed planted their own seed. Seed from this source was found to be lower in quality than both seed from seed dealers and seed from other farmers. Only seed obtained from local elevators (which accounted for less than 0.1% of the total acreage sampled) was found to be of lower quality. Those farmers planting their own seed planted an average of 27 total weed seeds per pound of wheat sown, 12 of which were noxious. Thirty-nine percent of these farmers did not clean their seed prior to

planting and 94% did not have the quality of their seed determined by laboratory analyses. Seed purchased from seed dealers proved to be the highest quality of all seed sources. However, only five percent of the total acres surveyed originated from seed dealers. Ninety-seven percent of the samples from this seed source had a varietal purity above 95%. They contained only two weed seeds per acre and virtually no other crop seeds. A higher percentage of samples obtained from seed dealers were cleaned and treated with pesticides than any other seed sources.

Comparisons of wheat seed quality within seed types revealed that survey pedigreed samples proved to be higher in quality than survey common samples in every analysis performed. They had higher genetic and mechanical purities, fewer weed seeds, higher germination rates, and a higher percent being cleaned and treated with pesticides. The O.C.I.A. pedigreed samples had higher genetic and mechanical purities, fewer weed seeds, and higher germination rates than the survey common and survey average samples.

Many farmers planted just "wheat" that is, many farmers did not know the varietal name of the seed they planted. Nearly 13% of the farmers sampled planted over 10% of the total acres surveyed with mislabeled varieties. It would be advantageous for the farmers to plant seed that is known to be genetically pure and has proven to be high yielding. The variety Vona accounted for 23% of the total acres surveyed. TAM W 101 was second with 22%, followed by Triumph 64 with 19%.

Seed cleaning was found to be closely associated with high quality seed. Cleaned samples had a significantly higher mechanical purity and significantly lower inert matter percentages. Cleaned samples, on the average, were also contaminated with fewer common and noxious weeds.

Thus, proper seed cleaning has proven to increase the quality of wheat seed. However, there was some evidence that the use of cleaning to improve poor quality seed resulted in a product that is improved but still of poor quality.

The results of this study also indicate that the quality of wheat seed planted in Oklahoma was better than that in the 1957 survey (3). In 1957 the average farmer sampled planted 12 noxious weeds, 128 common weeds, and 29 other crop seeds in each pound of wheat seeded. The average germination rate was 88.5%. The average farmer in 1980 planted his own seed at a rate of 63 pounds per acre. He planted seed contaminated with 11 noxious weeds, 13 common weeds, and 3 other crop seeds per pound of wheat sown. In addition, his seed had a mechanical purity and an inert matter percentage of 97.51% and 2.45%, respectively. It germinated at a rate of 95.3% and contained less than 4% varietal impurities.

It should be noted that a direct comparison between the number of noxious weeds found in the 1957 survey and this survey may not be valid due to differences in the weed species that appeared on the noxious weed list in 1957 and those listed in 1980.

Further studies of this type are needed to monitor not only the quality of wheat seed but other crops as well. In these studies it is recommended that, (1) the tags of certified seed lots should be collected with the sample in order to verify certification, (2) that County Extension Directors not be used to collect samples because their busy schedule with county and state fairs makes it difficult to collect samples, and (3) a question be included on the questionnaire designed to determine if any serious weed problems could have been introduced into an area as a result of farmers having their crop harvested by custom harvesters.

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APPENDIXES

APPENDIX A

PHENOL TEST

Dark Brown or Black	Light or Tan
Baca	Agent
Caprock	Danne
Centurk	Improved Triumph
Citation	Nicoma
Comanche	Palo Duro
Concho	Pronto
Crockett	Santana
Eagle	TAM W 101
Homestead	Tascosa
Hutch	Trison
Kaw	Triumph
Lancota	Triumph 64
Lindon	Yukon
Newton	
Osage	
Ottawa	
Parker	
Pawnee	
Payne	
Ponca	
Rall	
Rocky	
Sage	
Sandy	
Scout	
Scout 66	
Scoutland	
Sturdy	
Super Triumph	
TAM W 103	
TAM 105	
TAM 106	
Vona	
Warrior	
Wichita	
Wings	

APPENDIX B

SCIENTIFIC NAMES OF COMMON WEEDS, NOXIOUS WEEDS

AND OTHER CROPS

Common Weeds	Scientific Name
crabgrass	*Digitaria sanguinalis*
barnyardgrass	*Echinochloa crusgalli*
downy bromegrass	*Bromus tectorum*
flixweed	*Descurainia sophia*
foxtail barley	*Hordeum jubatum*
green flower pepperweed	*Lepidium densiflorum*
lambsquarter	*Chempodium album*
perennial ragweed	*Ambrosia psilostachya*
pigweed	*Amaranthus spp.*
primrose	*Oenothera laciniata*
rescuegrass	*Bromus catharticus*
sunflower	*Helianthus annuus*
tall thistle	*Cirsium altissiumum*
weedy panicum	*Panicum capillare*
witchgrass	*Panicum spp.*
yellow foxtail	*Setaria letescens*

Noxious Weeds	Scientific Name
Bindweed, field	*Convolvulus arvensis*
Buckwheat, wild	*Polygonum convolvulus*
Cheat	*Bromus secalinus*
Corncockle	*Agrostemma githago*
Dock	*Rumex spp.*
Goatgrass, jointed	*Aegilops cylindrica*
Johnsongrass	*Sorghum halepense* -- includes *Sorghum almum* and other indistinguishable seeds
Mustard, wild	*Brassica spp.*

APPENDIX B (Continued)

Other Crops	Scientific Name
Alfalfa	*Medicago sativa*
Australian fieldpea	*Pisum sativum*
Barley	*Hordeum vulgare*
Mungbeans	*Phaseolus aureus*
Oats	*Avena sativa*
Rye	*Secale cereale*
Sorghum	*Sorghum bicolor*
Soybeans	*Glycine max*
Vetch	*Vicia sativa*

APPENDIX C

PERCENT OF GROWERS PLANTING SEED TREATED WITH FUNGICIDES WITHIN EACH COUNTY SURVEYED CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	0.0			0.0	0.0
Blaine	0.0			28.6	23.5
Beaver	10.0	100.0		5.0	9.7
Caddo	50.0			46.7	47.3
Canadian	50.0			40.0	40.7
Custer	88.9	100.0	100.0	81.8	84.9
Harper	0.0	0.0		0.0	0.0
Jackson	100.0	100.0		47.1	64.0
Kingfisher	0.0	50.0	0.0	17.4	14.7
Kiowa	50.0	100.0		77.8	75.0
Major	0.0	100.0		11.8	20.0
Tillman	100.0	83.3		54.6	70.0
Texas	20.0			3.2	7.3
Washita	66.7	90.0		77.8	78.4
Woods	10.0	100.0		11.1	13.8
Woodward	0.0			22.2	18.2
Survey Average	32.2	86.2	50.0	32.0	36.2
Survey Common	-	-	-	-	30.8
Survey Pedigreed	-	-	-	-	63.1
OCIA Pedigreed	-	-	-	-	9.3
1957 Survey	-	-	-	-	-

APPENDIX D

PERCENT OF GROWERS PLANTING SEED TREATED WITH INSECTICIDES WITHIN EACH COUNTY SURVEYED CATEGORIZED BY SEED SOURCE

	Source				
County	Another Farmer	Seed Dealer	Local Elevator	Farmer's Own	Average
Alfalfa	0.0			0.0	0.0
Blaine	0.0			7.1	5.9
Beaver	10.0	100.0		10.0	12.9
Caddo	0.0			6.7	5.3
Canadian	0.0			8.0	7.4
Custer	0.0	0.0	0.0	4.6	3.0
Harper	0.0	0.0		0.0	0.0
Jackson	0.0	0.0		0.0	0.0
Kingfisher	12.5	0.0	0.0	26.1	20.6
Kiowa	50.0	0.0		11.1	16.7
Major	0.0	100.0		11.8	20.0
Tillman	33.3	0.0		0.0	5.0
Texas	0.0			0.0	0.0
Washita	11.1	10.0		5.6	8.1
Woods	10.0	100.0		5.6	10.3
Woodward	0.0			0.0	0.0
Survey Average	6.7	17.2	0.0	6.7	7.4
Survey Common	-	-	-	-	6.7
Survey Pedigreed	-	-	-	-	10.8
OCIA Pedigreed	-	-	-	-	0.0
1957 Survey	-	-	-	-	-

APPENDIX E

DEFINITION OF TERMS

Taken from the Oklahoma Seed Law (18).

(A) Kind or Variety Considered Pure Seed

The pure seed shall include all seeds of each kind and/or variety under consideration present in excess of 5% of the whole. Under certian circumstances kinds and/or varieties present to the extent of 5% or less of the whole may be considered pure seed. As for example, kinds or varieties shown on a label as components of a mixture in amounts of 5% or less. The following shall be included with the pure seed.

1. Immature or shriveled seed and seeds that are cracked or otherwise damaged.
2. Pieces of broken and otherwise damaged seeds that are larger than one-half of the original size.
3. Insect-damaged seeds, provided that the damage is entirely internal, or that the opening in the seed coat is not sufficiently large to allow the size of the remaining mass of tissue to be readily determined.
4. Seeds that have started to germinate.
5. All seed units of grasses in which a caryopsis with some degree of endosperm development can be detected either by slight pressure or by examination over light.

6. Diseased seeds. This does not include smut balls and other fungus bodies which shall be classified as inert matter.

(B) Other Crop Seed:

Seeds of plants grown as crops (other than the kind or variety included in the pure seed) shall be considered other crop seed, unless recognized as weed seeds by law, regulations, or by general usage. All interpretations and definitions for pure seed in Section A shall also apply in determining whether seeds are other crop seed or inert matter.

(C) Weed Seed:

Seed bulblets, tubers, or sporocarps of plants recognized as weeds by laws, official regulations, or by general usage shall be considered weed seeds. Certain badly injured weed seeds and underdeveloped seedlike structures, including those of noxious weed seed, as defined in Section D are considered inert matter.

(D) Inert Matter:

Inert matter shall include seeds and seed like structures from both crop and weed plants and other material not seeds as follows:

1. Seeds and seedlike structures from crop plants
   a. Pieces of broken and damaged seeds one-half or less of the original size.
   b. Glumes and empty florets except as stated under pure seed, Section A, 5.
   c. Seed units of grasses in which the caryopses are: spongy or corky, crumbly and white, filled with "insect frass," or replaced by nematode galls or by fungus bodies such as smut balls or ergot sclerotia.

2. Seed and seedlike structures from weedy plants, which by visual examination (including the use of light or dissection), can be definitely demonstrated as falling within the following categories.

   a. Damaged seed (other than caryopses of grasses) with over one-half of the embryos missing.

   b. Grasses: (i) damaged caryopses, including free caryopses of quackgrass, Agropyron repens, with over one-half of the root-shoot axis missing (the scutella excluded); (ii) immature florets of quackgrass in which the caryopses are less than one-third the length of the palea; (iii) free caroypses of quackgrass devoid of embryos; (iv) undeveloped glumes, and florets devoid of both embryo and endosperm.

   c. Seeds of legumes and species of Brassica with the seed coats entirely removed.

   d. Undeveloped seed units, devoid of both embryo and and endosperm, such as occur in the following plant families: sedge (Cyperaceae), buckwheat (Polygonaceae), morning-glory (Convolvulaceae), night-shade (Solanaceae), and sunflower (Compositae).

   e. Ragweed (Ambrosia): Seed with both the involucre and pericarp absent.

3. Other Matter That Is Not Seed:

   a. Nematode galls, including galls enveloped by the lemma and palea of grass florets

b. Fungus bodies, such as ergot and other sclerotia, and smut balls.

c. All inert matter such as soil particles, sand, stones, chaff, stems, leaves, flowers, cone scales, pieces of bark, pieces of resin, etc.

VITA

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