Estimating the Weight of Cottonseed by Gins

by John D. Campbell

FARMER COOPERATIVE SERVICE
U. S. DEPARTMENT OF AGRICULTURE

Service Report 29

July 1957

FARMER COOPERATIVE SERVICE

U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON 25, D. C.

Joseph G. Knapp, Administrator

The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, financing, merchandising, product quality, costs, efficiency and membership.

The Service publishes the results of such studies; confers and advises with officials of farmer cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

This study was conducted under authority of the Agricultural Marketing Act of 1946 (RMA Title II).

CONTENTS

SUMMARY

Less than half the cottonseed that growers sell to ginners is weighed when purchased. The rest is purchased on estimated weights.

Actually anywhere from 600 to over 1,000 pounds of cottonseed may come from the amount of seed cotton needed to make a 500-pound gross weight bale. Thus estimated weights of cottonseed may be so inaccurate as to cause risks for both growers and ginners. Some growers lose substantial amounts while others receive more than is rightfully theirs. On the other hand, ginners may underestimate or overestimate average weights and thereby gain or lose.

For some time, it has been generally recognized that estimated weights and scale weights differ. Yet no accurate measurements have been made of the extent of such differences and the problems that accompany them.

Recently Farmer Cooperative Service made a study to determine the size and frequency of these differences and their effects on ginners and growers. The study used data which included scale weights as well as estimated weights of seed from five cooperative gins in Texas and Oklahoma and one in California. These represented hand-picked, snapped and stripped and one-variety cotton. Most of the results apply equally to both commercial and cooperative gins.

Among important facts brought out in this study were the following:

** Ginners would have overestimated or underestimated the seed on half of the bales ginned by an amount in excess of 30 pounds by using any of the customary bases for estimating seed.

** When cottonseed weights were estimated by an average seed-lint ratio--which appeared to be the best base being used --and price of cottonseed was quoted at $60 a ton, the price some growers received was as much as $8 a ton less than it would have been if the seed had been weighed. Seed-lint ratio is weight of cottonseed divided by gross weight of bale when both are ginned from the same lot of seed cotton. This ratio is usually expressed in units and tenths but sometimes in units and hundredths.

** Using estimated cottonseed weights, some growers would have averaged losing or gaining more than $2.50 a bale. Loss or gain on a crop depended on number of bales.

** Cooperative gins that handle cotton on the basis of estimated weights do not eliminate inequities among their grower members and may even increase them.

** The cost of purchasing and operating suitable seed scales would likely be much less than the indirect cost of continuing the risks and inequities arising from estimating cottonseed weights.

** Seed-lint ratios varied widely -- from State to State and within the

same State, from year to year and even from day to day at the same gin, from gin to gin within the same area, from grower to grower and even from bale to bale of the same grower's cotton. Ginning a single variety of cotton did not keep these ratios from fluctuating.

** As the season advances, ginners generally lower their ratios, but the study showed seed-lint ratios actually went up for most of the season--if not all.

** Seed-lint ratios proved the most consistent base for estimating cottonseed weights, although their wide variations kept them from being generally satisfactory.

** Cottonseed as a percentage of seed cotton also varied between gins in the same year and between years at the same gin. However, this was the most accurate base for estimating cottonseed weights on very clean cotton. Harvesting methods affected percentage of cottonseed. When trash made up a substantial part of some seed cotton, percent of cottonseed was not an accurate base for estimating seed weights.

** Relationship of percent trash and percent lint would probably be close enough on high-turnout picked cotton to provide a base as good as some of the others for estimating weight of cottonseed. However, since accurate data on percentages of trash are lacking, this would generally be a poor base for estimating weights.

** When seed-lint ratios, percentages of cottonseed, and percentages of trash were related to percentages of lint or turnout, some improvements in estimates occurred. However, variations on low turnouts were excessively large on percentages of cottonseed and of trash. Seed-lint ratios gave the most consistent estimates when related to turnouts. Data for establishing current relationships of turnouts to seed-lint ratios, percent of cottonseed, or percent of trash would be so difficult to determine that the use of these relationships would generally be impractical.

** Seed-lint ratios and percentages of cottonseed and of trash by successive parts of the season gave improvement in some cases over the same base for the entire season. However, the variations on the latter part of the season were excessive for percent of cottonseed and percent of trash. Parts of the season gave little improvement over season average in seed-lint ratios on snapped cotton.

This study emphasizes that none of the bases commonly used for estimating weight of cottonseed give either ginners or growers any assurance of accuracy. Seed scales are necessary for accuracy and equitable treatment of gin patrons.

Estimating the Weight of Cottonseed by Gins

By John D. Campbell

Cotton and Oilseed Branch

Marketing Division

In most cotton growing areas, ginners buy nearly all the cottonseed sold by farmers. Less than half this cottonseed is actually weighed. In 1954, for example, ginners bought 55 percent of the cottonseed crop on estimated weights. 1/ Farmers sold a total of approximately 5.3 million tons of cottonseed that year at an average price of $60 a ton. This means that they sold on estimated weights about 2.8 million tons of cottonseed worth almost $170 million.

Possibilities of two major discrepancies are inherent in buying and selling cottonseed on estimated weights. One is that the ginner may lose or gain a substantial tonnage of seed during a ginning season with a corresponding gain or loss to the grower-patrons as a group. The other is that individual growers may lose or gain a significant number of pounds of seed on each bale or load of seed cotton ginned, or on their total crop, even though during the ginning season the ginner may sell exactly the same total quantity of seed he buys.

Thus, ginners who do not have cottonseed scales have a problem when they estimate the weight of cottonseed. They need to be conservative in order to protect their own interests. At the same time they want to treat their patrons equitably and they must meet competition.

PURPOSE AND METHOD OF STUDY

Possibilities of differences between estimated and scale weights of cottonseed at gins and inequities between growers have been recognized for many years. However, their size and frequency have received little attention.

1/ Fortenberry, A. J. "Charges for Ginning Cotton". U.S. Agricultural Marketing Service, Marketing Research Report 120, June 1956, pp 35-37.

The general purpose of this study was to determine the importance of such differences and inequities. Its specific aims were: (1) To determine the frequency and extent of differences between estimated weights and scale weights of cottonseed; (2) to show the magnitude of the loss or gain that a given gin may incur during an entire ginning season; (3) to measure inequities with respect to individual farmers; and (4) to suggest alternatives and improvements.

In preparation for the study, the Farmer Cooperative Service collected scale weights on 10,800 bales from five cooperative gins in Texas and Oklahoma. Of the 10,800 bales, 2,900 were taken in from 10 to 13 percent samples, which represented 24,700 other bales. Data collected included scale weights on individual bales of seed cotton, gross weights of the bales, and scale weights of the cottonseed. Some data were also obtained from cooperative gins in California.

These data from cooperative gins are believed to be generally typical for cooperative or other gins in these areas. The Lower Rio Grande Valley gins in Texas represent hand picked cotton and the Oklahoma gins represent snapped and stripped cotton. The Coastal Bend gin was included because it had data on bales of individual growers. California gin data were included because all cotton ginned was of the same variety.

These data were used to calculate bases such as ginners use in estimating seed weights. Bases were computed for 500-pound gross weight bales, because ginners ordinarily use gross weights in figuring lint turnouts. Tests indicated that the difference between gross and net weights did not affect the relationships found in this study.

Scale weights of cottonseed from individual bales were compared to the average of the scale weights, as if the average had been estimated, to determine the differences between them.

This report evaluates the accuracy of three bases commonly used by ginners in estimating seed weights. These bases are:

1. Seed-lint ratio (weight of cottonseed divided by weight of bale or bales).

2. Percentage of cottonseed (weight of cottonseed divided by weight of seed cotton).

3. Percentage of trash or foreign matter (residual weight of trash divided by the weight of seed cotton).

The percentage of lint (gross weight of bale divided by weight of seed cotton) is sometimes combined with one of the above bases for estimating weight of cottonseed.

The accuracy of percentages and ratios calculated for each bale or load of seed cotton is influenced to some extent by the accuracy of the initial scale weights of cottonseed, seed cotton and running bales

as recorded by the gins included in the study. Improper adjustment or even faulty design of scales may have caused inaccuracies in weights. The seed roll in gin stands may have been ginned out more on some bales than on others even though gin operators intend to maintain uniform seed rolls. Certain of these inaccuracies tend to offset each other.

In this study, two or more bales ginned from the same load of seed cotton were recorded as if they were identical bales from separate loads. This reduced the variation for the total bales ginned during the season at some gins, as multiple bale loads greatly outnumbered single bale loads.

Publications of State Agricultural Experiment Stations and the United States Department of Agriculture provided background and supplementary information.

ESTIMATING METHODS GENERALLY USED

Procedures used by ginners in estimating the weight of cottonseed in the United States have been classified into four general methods. The relative importance of three of these methods changed substantially from 1944 to 1954 (Table 1).

The first method listed, seed cotton weight minus gross weight of bale, assumes that the sum of the weights of seed and baled lint will add up to the weight of the lot of seed cotton from which it was ginned. Approximately 20 pounds of bagging and ties added to a running bale automatically allows for removal of that amount of trash in the ginning process. This method has been more generally used in areas where cotton is carefully harvested by hand picking. The decline in its use from 37 to 11 percent of the total crop between 1944 and 1954 is apparently associated with increased use of seed scales and cotton picking machines and with rougher methods of hand harvesting in these areas.

The second method listed, seed cotton weight minus gross weight of bale minus a deduction for trash, was used on about a fourth of the total crop in both 1944 and 1954. This method is essentially the same as the first except that additional weight is deducted for trash. It has almost innumerable variations. The weight deducted for trash or foreign matter varies from a few pounds to 50 percent or more of the weight of seed cotton where harvesting is done by mechanical stripping. Generally the weight deducted for trash is increased as the percent of lint turnout decreases. The reliability of this method depends on the accuracy of estimating the weight loss during ginning.

Cottonseed weight as a percentage of seed cotton weight, the third method listed in table 1, accounted for only 7 percent of the crop in 1944 and had declined by more than half to 3 percent by 1954. This method, like the first one described, is accurate and reliable only for very clean, hand-picked cotton. Its decline in use also is apparently associated with increased use of seed scales, cotton harvesting machines and rougher hand harvesting methods.

Table 1. - Proportions of cottonseed purchased by ginners by methods used to determine cottonseed weights, United States, crops of 1944 and 1954

Methods	Percent purchased	
	1944	1954
Estimated from -		
Seed cotton weight minus gross weight of bale	37	11
Seed cotton weight minus gross weight of bale minus deduction for trash	26	25
Cottonseed weight as a percentage of seed cotton weight	7	3
Bale weight multiplied by seed lint ratio	4	15
Other estimating methods	1	1
Total by estimating	75	55
Weighed on seed scales	25	45
Total - all methods	100	100

Source: Compiled from "Charges for Ginning Cotton, Seasons 1947-48 to 1954-55," by A.J. Fortenberry, U. S. Agricultural Marketing Service.

The fourth method listed in table 1, bale weight multiplied by seed-lint ratio was the only estimating method that increased from 1944 to 1954. This method is based on the assumption that the relationship between the weight of lint and seed tends to be constant, irrespective of the amount of trash in the seed cotton. Its use increased from 4 to 15 percent of the crop - almost four times -- indicating that ginners consider it the most reliable in the face of increasing trash in seed cotton. Increased production in California and wider use of this method there also reflected in the higher percentage.

These four general methods of estimating cottonseed weights consist of numerous specific methods and formulas. Most of them are computed from one or more bases of percentage and ratio referred to in the preceding section or from amounts that can be readily converted into one of those bases. The specific formulas are too numerous to examine individually. Therefore, in this report bases are analyzed, rather than the four general methods or selected examples of specific methods.

VARIATIONS IN SEED-LINT RATIOS

Seed-lint ratios will be analyzed first. The increase in their use, as compared with declines in the other methods of estimating, suggests this priority. Rougher hand harvesting and greater use of machines raise the proportion of trash in seed cotton. It seems likely that these rougher methods of harvesting will continue to increase and that use of seed-lint ratios, where seed scales are not used, will also increase.

The seed-lint ratio is calculated by dividing the weight of cottonseed by the gross weight of the bale when both are ginned from the same lot of seed cotton. The ratio is usually expressed in units and tenths and less frequently in units and hundredths.

Examples of seed-lint ratios and estimated pounds of cottonseed per 500 pound gross weight bale follow:

Seed-lint ratios	Pounds of cottonseed
1.4	700
1.45	725
1.5	750
1.55	775
1.6	800
1.65	825
1.7	850

A seed-lint ratio of less than 1.4 or higher than 1.7 is seldom used in practice, although ratios of 1.2 to over 2.0 occur. Likewise, ratios with two decimal places are not widely used. An increase of 0.1 in a seed-lint ratio results in an increase of 50 pounds of seed per 500-pound gross weight bale. An increase of 0.01 adds 5 pounds. Gins commonly lower the seed-lint ratio used as the ginning season advances and more foreign matter is harvested in seed cotton.

Variations in seed-lint ratios will be discussed first by States.

By States

Variations in seed-lint ratios occurred between different States in the same year and between different years for the same State. These variations were large enough to be important.

Seed-lint ratios for each of the cotton growing states for 1951-55 were computed from Agricultural Statistics and Crop Production Reports. Table 2 shows significant variations both between States and between years. In 1952, for example, the 1.57 seed-lint ratio for Louisiana was 0.19 less than the 1.76 ratio for South Carolina - a difference of 95 pounds of seed per 500-pound gross weight bale. As an example of variations between different years for the same State - the ratio for Arizona was 1.72 in 1951 and 1.64 in 1955 - a difference of 40 pounds per bale.

The importance of these differences shows up clearly when they are computed for the total production of a State. For example, the seed-lint ratio for Arkansas was 1.68 in 1951 and 1.59 in 1952. This difference of 0.09 amounts to 45 pounds of cottonseed per 500-pound bale. If all ginners in the State had used the 1951 ratio of 1.68 to estimate the seed ginned from the 1952 crop, they would have paid for approximately 30,000 tons too much seed. At $60 a ton this would have cost the ginners $1,823,000.

The reverse would have occurred had Arkansas ginners used the 1953 ratio of 1.58 to estimate the 1954 crop when the ratio was 1.67. The growers as a group would have been penalized an average of 45 pounds a bale - or a total of $1,844,000 at the average farm price of $60 a ton.

The average seed-lint ratio for all cotton States in the United States for the 5-year period 1951-55 was 1.65 (table 2). Had all ginners used a 1.5 ratio to estimate the seed, growers would have been penalized an average of 75 pounds of cottonseed a bale. Since total United States production averaged 15 million gross-weight 500-pound bales for those years, this would have meant an average loss to growers of more than 560,000 tons of cottonseed each year. At $60 a ton, this would have amounted to $33.7 million.

The average seed-lint ratio shows less variation from year to year for large areas representing more production and a greater number of gins because the differences between geographic areas, gins, and individual farms, and from bale to bale tend to be offsetting. This is illustrated by the consistent ratios in Texas and for the United States as a whole over the 5-year period.

Between Gins and Between Years

> Seed-lint ratios varied between areas, between nearby gins in the same area, and between seasons for the same gin. The differences were substantial. A ginner cannot safely use the average seed-lint ratio of a nearby gin for the same year or the ratio from his own gin for the preceding year in estimating cottonseed weights.

The seed-lint ratio may be determined for any gin for any period of time for which gross weight of running bales ginned and weight of cottonseed ginned from these same bales are known. The period or volume might be for one or more bales ginned in a day, week, month, or entire season. Seed weights may be determined from sales invoices or by catching and weighing the seed from one or more bales, even though seed scales are not available.

Table 3 shows seed-lint ratios of selected gins in Oklahoma, Texas, and California in the years 1951-56.

Average seed-lint ratios for the two Oklahoma and the three Texas gins were determined from scale weights of bales and cottonseed from single and

Table 2. - Seed-lint ratios, by States and for United States, crop years 1951-55

State	1951	1952	1953	1954	1955	Average 1951-55
Alabama	1.63	1.60	1.57	1.63	1.58	1.60
Arkansas	1.68	1.59	1.58	1.67	1.63	1.63
Arizona	1.72	1.66	1.65	1.65	1.64	1.66
California	1.60	1.63	1.63	1.66	1.64	1.63
Georgia	1.64	1.63	1.63	1.67	1.63	1.64
Louisiana	1.62	1.57	1.65	1.65	1.64	1.63
Mississippi	1.63	1.58	1.65	1.67	1.62	1.63
Missouri	1.76	1.71	1.69	1.75	1.70	1.72
New Mexico	1.70	1.60	1.68	1.61	1.61	1.64
North Carolina	1.68	1.68	1.65	1.70	1.66	1.67
Oklahoma	1.65	1.58	1.60	1.67	1.62	1.62
South Carolina	1.72	1.76	1.66	1.72	1.68	1.62
Tennessee	1.63	1.59	1.59	1.63	1.61	1.61
Texas	1.68	1.67	1.66	1.67	1.67	1.67
All others 1/	1.70	1.56	1.92	1.69	1.68	1.71
United States	1.66	1.64	1.64	1.67	1.65	1.65

1/ Includes: Virginia, Florida, Illinois, Kentucky, Kansas, and Nevada.

Sources: Compiled from Cotton and Cottonseed production as reported in Agricultural Statistics for 1951-1954, and Crop Production Reports, U. S. Department of Agriculture, for 1955.

multiple bale loads.

Seed-lint ratios for the five California gins were computed from cottonseed sales invoices and gross weights of the bales.

The two Oklahoma gins were within about 35 miles of each other, and the two Rio Grande Valley gins were about the same distance apart. Varieties of cotton grown, rainfall and other climatic conditions, harvesting methods, soil types, and farming practices were similar at gins in each of the two areas. The Oklahoma gins represent seed cotton roughly harvested by hand snapping or machine stripping. The Rio Grande Valley and California cotton was predominantly hand picked. In the Coastal Bend area in Texas most of the cotton was harvested by hand snapping with some hand picking.

In 1951, the two nearby Oklahoma gins had an average difference of 0.09 in the seed-lint ratio, the equivalent of 45 pounds of seed per 500-pound gross weight bale. Similarily, there was an average difference of 55 pounds per bale between the two lower Rio Grande Valley gins in 1953.

All five California gins were within a radius of 50 miles and all ginned the same variety, as only one variety is grown in the San Joaquin Valley. Moisture and other factors affecting seed-lint ratio are considered to be more constant in this valley than in most other cotton growing areas. The cotton was picked either by hand or machine. However, in 1954 the average seed-lint ratios for these gins differed by as much as 0.14 or 70 pounds per 500-pound gross weight bale.

The average seed-lint ratios varied about as much at the same gins from year to year as between different gins in the same area in a single year (table 3). The seed-lint ratio for Texas Gin No. 1 differed by 0.08 between 1951 and 1953, or 40 pounds of seed per 500-pound bale. At Texas Gin No. 3, a 500-pound bale averaged 45 pounds more seed in 1954 than in 1955.

Differences of from 0.08 to 0.14 in average seed-lint ratios, the equivalent of from 40 to 70 pounds of cottonseed per 500-pound bale, showed up between individual California gins within the same year. The smallest difference in a season (40 pounds per 500-pound bale) was between California Gins No. 3 and No. 4 in 1956 (table 3). The largest difference (70 pounds a bale) was between Gins No. 2 and No. 5, in 1954.

Between Bales at Individual Gins

> Seed-lint ratios of individual bales at selected gins varied so widely that the use of any given ratio would have resulted in sizeable gains and losses on a large part of the bales.

A ginner has no possible way of knowing at the beginning of a season what the average seed-lint ratio will actually be. Even if he could predict the season's average accurately, he would unavoidably overestimate or

Table 3. - Seed-lint ratios of selected gins in Oklahoma, Texas, and California, crop years 1951-56

Location of gins	Predominant harvesting method	Seed-lint ratio by years					
		1951	1952	1953	1954	1955	1956
Oklahoma - Southwestern							
Gin No. 1	Snapped	1.72					
Gin No. 2	Snapped	1.63					
Texas - Lower Rio Grande Valley							
Gin No. 1	Picked	1.64	1.58	1.56			
Gin No. 2	Picked			1.67			
Texas - Coastal Bend Area							
Gin No. 3	Snapped		1.62	1.58	1.66	1.57	
California - San Joaquin Valley							
Gin No. 1	Picked	1.56	1.59	1.60	1.72	1.67	1.57
Gin No. 2	Picked				1.66	1.62	1.58
Gin No. 3	Picked				1.74	1.66	1.64
Gin No. 4	Picked				1.76	1.70	1.56
Gin No. 5	Picked				1.80	1.73	1.63

Table 4. - Percentage distribution of bales by seed-lint ratios, average seed-lint ratio and minimum variation of half of bales; Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Seed-lint ratio		Cottonseed per 500-pound bale 1/	Distribution of bales	
Class interval	Midpoint or average		Texas Gin No. 2	Oklahoma Gin No.1
		Pounds	Percent	Percent
1.20 - 1.29	1.25	625	-	1
1.30 - 1.39	1.35	675	2	1
1.40 - 1.49	1.45	725	8	3
1.50 - 1.59	1.55	775	22	13
1.60 - 1.69	1.65	825	25	28
1.70 - 1.79	1.75	875	20	28
1.80 - 1.89	1.85	925	14	17
1.90 - 1.99	1.95	975	8	7
2.00 - 2.09	2.05	1025	1	2
			100	100
Bales ginned . . . . . (number)			5500	2060
Average seed-lint ratio. . .			1.67	1.72
Average cottonseed per 500-pound bale (pounds). . .			835	860
Minimum variation above and below average of half of bales 2/ . . . . . (pounds of cottonseed)			45	45

1/ 500-pound gross weight bales. Cottonseed computed or estimated from midpoint or average ratio.

2/ Based on the statistical theory that 0.6745 of the standard deviation of a normal distribution measured on each side of the mean includes approximately one-half of the items in the distribution. This statistical measure was converted to pounds per 500-pound gross weight bale by multiplying by 500.

underestimate, by varying amounts, the pounds of seed in individual bales.

At Texas Gin No. 2 and Oklahoma Gin No. 1, seed-lint ratios between individual bales differed by several 0.1 class intervals, each of them representing a difference of 50 pounds of seed per 500-pound bale (table 4). If the ginner at Oklahoma Gin No. 1 had selected the average ratio of 1.72 for the 1951 season, he would have overestimated the seed from 18 percent of all bales ginned (those with less than 1.60 ratios) by more than 60 pounds per bale. He would have underestimated 26 percent by more than 40 pounds per bale. The percentage distribution of Texas Gin No. 2 shows 25 percent of the bales in the largest class interval groups. The use of the seed-lint ratio of that group or any other group for all bales ginned throughout the season would have resulted in substantial inaccuracies for individual bales.

A standard statistical measure may be used to indicate the variations of individual bales from the average and it may be expressed in pounds. 2/ On that basis the minimum variations above and below average on half of all bales at both Texas Gin No. 2 and Oklahoma Gin No. 1 were 45 pounds per bale as shown by the last line of table 4.

During Ginning Season

> Seed-lint ratios did not decline as percentage of lint or turnout declined. They tend to increase as the season advances. However, they might fall off slightly toward the end of the ginning period or continue to increase. The irregularity of the changes indicated that ginners could not forecast accurately what adjustments to make in their seed-lint ratios during the season, or even whether to increase or decrease the ratios.

Seed-lint ratios computed from data pertaining to parts of a season would seem likely to eliminate some of the variables that occur during an entire season. Therefore, the total bales ginned were divided into five consecutive volume groups, for Texas Gin No. 2 in 1953 and for Oklahoma Gin No. 1 in 1951. Similar computations were made for California gins, although the data available were for irregular periods and varying volumes.

In many areas it is customary for the ginner to lower the seed-lint ratios as the ginning season advances. Such reductions are apparently made on the theory that seed-lint ratios decline as turnouts decline. However, at the gins studied, the average seed-lint ratios and the corresponding seed per bale tended to increase on most of the groups as the season advanced (tables 5 and 6). The last 20-percent volume group at Texas

2/ This theory is that 0.6745 standard deviations include one-half of the total numbers of observations in the distribution. Multiplication of that fraction by 500 converts it to pounds of cottonseed above and below the average of half of the bales.

Table 5. - Average seed-lint ratios, estimated cottonseed, and minimum variations by five equal volume groups, at Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Equal volume groups	Bales ginned	Average seed-lint ratio	Estimated average cottonseed in 500-pound bale	Minimum variation, above and below average on half of bales
	Number		Pounds	Pounds
Texas Gin No. 2				
1st 20 percent	1,100	1.54	770	30
2nd 20 percent	1,100	1.63	815	40
3rd 20 percent	1,100	1.72	860	45
4th 20 percent	1,100	1.75	875	40
5th 20 percent	1,100	1.71	855	45
Total or average	5,500	1.67	835	45
Oklahoma Gin No. 1				
1st 20 percent	412	1.72	860	40
2nd 20 percent	412	1.73	865	50
3rd 20 percent	412	1.74	870	45
4th 20 percent	412	1.72	860	45
5th 20 percent	412	1.69	845	45
Total or average	2,060	1.72	860	45

Table 6. - Average seed-lint ratios and cottonseed per bale, selected periods and volumes, California Gin No. 1, 1954

Period	Bales	Average seed-lint ratio	Average cottonseed in 500-pound bale
	Number		Pounds
Oct. 2 to Oct. 15	1500	1.63	814
Oct.16 to Oct. 29	2000	1.70	849
Oct.30 to Nov. 6	1500	1.72	862
Nov. 7 to Nov. 17	1500	1.74	871
Nov.18 to Dec. 7		(A rainy period)	-
Dec. 8 to Feb. 17	1500	1.84	921

Gin No. 2 declined 20 pounds per bale compared with the preceding group but still exceeded the first and second groups in seed per bale and almost equalled the third group.

At Oklahoma Gin No. 1 the fourth 20 percent group declined slightly from the average of the third (table 5) but was still equal to the first group. The last group averaged 15 pounds less seed per bale than any of the preceding groups.

At California Gin No. 1, seed increased each succeeding period as the season advanced. The average seed per bale in the last period exceeded that in the first by over 100 pounds per 500-pound bale (table 6).

Even if ginners at Texas Gin No. 2 and Oklahoma Gin No. 1 had used the correct average seed-lint ratio carried to hundredths, they would still have missed the scale weights of the seed from half the bales by 30 to 50 pounds per bale, as shown by the minimum variations (table 5). There was a tendency for the minimum variations to widen as the season advanced.

By Days and Weeks

Average seed-lint ratios varied from day to day. Estimating weights on the basis of a daily or weekly seed-lint ratio was little more accurate than estimating on the basis of an average ratio

Table 7. - Average seed-lint ratio, estimated cottonseed and variations by days and week, Texas Gin No. 1, 1952 and Oklahoma Gin No. 1, 1951

Area and date	Bales	Average seed-lint ratio	Estimated average cotton-seed in 500-pound bale	Minimum variation of cottonseed above & below average
	Number		Pounds	Pounds
Texas Gin No. 1				
July 14	134	1.51	755	25
July 15	215	1.54	770	45
July 16	259	1.53	765	35
July 17	224	1.52	760	35
July 18	191	1.52	760	35
July 19	79	1.63	815	40
Week, July 14-19	1,102	1.54	770	35
Gin, for season	8,500	1.58	790	35
Oklahoma Gin No. 1				
October 16	32	1.75	875	50
October 17	57	1.75	875	45
October 18	57	1.77	885	40
October 19	45	1.77	885	45
October 20	54	1.73	865	45
October 21	30	1.77	885	50
Week, Oct. 16-21	275	1.75	875	45
Gin, for season	2,060	1.72	860	45

for the season or for 20-percent volume groups.

Various factors such as rain and frost may influence seed-lint ratios materially within a few weeks or even a few days. For this reason, variations during shorter periods of time needed to be determined.

The daily average seed-lint ratio fluctuated between 1.51 and 1.54 at Texas Gin No. 3 in the first 5 days of the week of July 14 (table 7). On the sixth day, the ratio jumped to 1.63. Bales ginned that day averaged 815 pounds of cottonseed or about 50 pounds more per bale than for the 5 preceding days.

The daily average seed-lint ratio at Oklahoma Gin No. 1 varied from 1.73 to 1.77 or a range of 20 pounds of cottonseed per bale during the week.

Minimum variations of cottonseed above and below the average daily ratios on half of the bales ranged from 25 to 40 pounds of seed per 500-pound bale at Texas Gin No. 3 (table 7). Variations at Oklahoma Gin No. 1 ranged from 40 to 50 pounds a bale. Minimum variations on half the bales for the entire week were 35 pounds of seed a bale at the Texas gin and 45 pounds at the Oklahoma gin.

Minimum variations from the average of the daily seed-lint ratios at Oklahoma Gin No. 1 were as wide as for the 20-percent volume groups (tables 5 and 7). At that gin the minimum variations from the average were also as large for the week of October 16 to 21 as for the entire season.

By Percent-Lint Groups

> Cottonseed weights could be estimated somewhat more accurately on the basis of percent-lint groups than on 20-percent volume groups. However, the method would not be practical for ginners. Averages for other years could not be used satisfactorily because of changes in seed-lint ratios and turnouts from season to season, and information needed to establish the relationship during a season was difficult to obtain without seed scales.

Percent of lint or turnout may be determined at any gin from scale weights of seed cotton and the bale lint. The relationships of percent of lint to seed-lint ratios found in this study follow.

Seed-lint ratios and pounds of cottonseed per 500-pound bale increased as percent of lint declined at both Texas Gin No. 2 and Oklahoma Gin No. 1 (table 8). Estimated seed from 500-pound bales increased over 100 pounds from the highest to lowest turnout groups at Texas Gin No. 2 and 75 pounds at Oklahoma Gin No. 1.

Table 8. - Average seed-lint ratios, estimated cottonseed and minimum variation, by percent-lint groups, at Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Percent-lint groups	Bales ginned	Average seed-lint ratios	Estimated average cotton-seed in 500-pound bale	Minimum variation, above and below average on half of bales
	Number		Pounds	Pounds
Texas Gin No.2				
37.0 and over	960	1.52	760	25
35.0 - 36.9	1,400	1.61	805	30
33.0 - 34.9	1,380	1.69	846	30
31.0 - 33.9	1,960	1.78	890	30
Under 31.0	800	1.79	895	45
Total or average	5,500	1.67	835	45
Oklahoma Gin No.1				
27.0 and over	117	1.62	810	40
25.0 - 26.9	423	1.67	835	40
23.0 - 24.9	726	1.73	865	45
21.0 - 22.9	478	1.75	875	50
Under 21.0	316	1.77	885	50
Total or average	2,060	1.72	860	45

Minimum variations on half the total bales ginned were somewhat smaller for percent-lint groups than for the 20-percent volume groups for Texas Gin No. 2 but not for Oklahoma Gin No. 1 (tables 5 and 8). If the ginner at Texas Gin No. 2 had used the average seed-lint ratios by percent turnout groups, he would have missed the seed in half the bales by 25 to more than 45 pounds (table 8). The larger differences would have occurred on the lower turnout groups.

The results at Oklahoma Gin No. 1 would have been similar. There, the ginner would have missed the seed in half the bales from more than 40 pounds for the highest turnout groups to more than 50 pounds in the lowest turnout groups.

By Individual Growers

> Average seed-lint ratios of individual growers frequently differed substantially from gin ratios. Bales of individual growers varied greatly in seed weights and the total number of bales ginned did not appear to affect the relationship between a grower's ratio and that of the gin. Differences in average seed weight per bale were the major source of inequities between growers.

Individual growers are interested primarily in how the estimated weight of their cottonseed compares with the actual weight for the season. Two factors frequently considered in this connection are: (1) How the average scale weight of seed per bale of the individual grower compares to the ginner's estimate, and (2) the number of bales the grower needs in order for variations between individual bales to offset each other so that the average applies.

Data by growers were available at Texas Gin No. 3. For 27 out of 51 times in 3 years average seed-lint ratios of 17 individual growers were above or below the average ratios of the gin by 0.04 or more (table 9). Increases in the number of bales ginned by individual growers did not appear to move their ratios any closer to the gin ratio.

Even when the ratio of a grower coincided with the gin ratio for one year, his ratio differed from that of the gin in the preceding and the following years.

A detailed check was made of the average pounds of cottonseed per 500-pound bale of four growers at Texas Gin No. 3 in 1954. The average seed-lint ratios of these growers differed from one another by 0.08 to 0.32 in the 1954 season (table 10), and average seed per bale differed by as much as 160 pounds.

Table 9. - Average seed-lint ratios and number of bales of 17 growers, and ratios of Texas Gin No. 3, 1952-54

Growers	Average seed-lint ratios			Number of bales ginned		
	1952	1953	1954	1952	1953	1954
A	1.66	1.58	1.76	8	7	10
B	1.65	1.67	1.75	9	5	10
C	1.75	1.52	1.81	10	7	40
D	1.63	1.56	1.68	17	10	21
E	1.58	1.52	1.69	17	11	29
F	1.57	1.56	1.50	18	11	16
G	1.61	1.58	1.72	21	14	9
H	1.53	1.48	1.52	23	10	27
I	1.63	1.57	1.65	23	14	21
J	1.62	1.82	1.58	29	12	31
K	1.63	1.56	1.63	30	14	10
L	1.62	1.62	1.62	38	16	13
M	1.59	1.53	1.74	54	35	63
N	1.62	1.54	1.66	87	39	63
O	1.61	1.56	1.58	90	38	62
P	1.57	1.55	1.55	97	67	106
Q	1.57	1.59	1.74	138	52	100
Gin average	1.62	1.58	1.66			
Number of grower ratios 0.04 or more						
Above	2	3	6			
Below	5	5	6			
Total	7	8	12			
Total seed-lint ratios above or below average by 0.04 -- 27						
Number bales included in gin average				978	633	2,617

Table 10. - Average seed-lint ratios, estimated cottonseed, and variations for four selected growers at Texas Gin No. 3, 1954 season

Growers	Bales ginned	Average seed-lint ratio	Estimated average cottonseed in 500-pound bale	Minimum variation above and below average of individual growers on half of their bales
	Number		Pounds	Pounds
1	25	1.66	830	40
2	50	1.52	760	15
3	79	1.84	920	25
4	100	1.74	870	40
Gin total or average	2,617	1.66	835	40

VARIATIONS IN COTTONSEED AS PERCENTAGE OF SEED COTTON

If cottonseed were a constant or nearly constant proportion of seed cotton, ginners could use a percentage chart to estimate its weight. However, percentages of seed vary from gin to gin in a given year or area, and from year to year at a given gin. Other constant or variable relationships include percentage of seed by volume groups, by percent-lint groups and by individual growers. These relationships were examined and a discussion of them follows.

Between Gins and Between Years

Cottonseed as a percent of seed cotton varied between gins in the same year and between years at the same gin. Harvesting methods affected the percentage of cottonseed.

The method of harvesting would be expected to materially influence the percentage of cottonseed in seed cotton. Such differences were apparent at the gins included in this study (table 11). Snapped cotton averaged close to 40 percent seed, while picked cotton averaged around 55 percent.

On first inspection, it appears that percentages of cottonseed are about the same at gins in the same area (table 11). The two Oklahoma gins

differed only 0.4 in average percentage of seed and the Texas Lower Rio Grande Valley gins by 1.3. However, these percentages apply to different bases or amounts of seed cotton. An average of 2,137 pounds of seed cotton was required to make a 500-pound bale at Oklahoma Gin No. 1 but only 2,041 pounds at Oklahoma Gin No. 2. Oklahoma Gin No. 1 averaged 860 pounds of cottonseed to a 500-pound bale, while Oklahoma Gin No. 2 averaged 815 pounds or 45 pounds less per bale. The average seed per 500-pound bale differed by 55 pounds between Texas Gin 1 and 2.

Table 11. - Cottonseed as a percent of seed cotton at six individual gins by method of harvesting, 1951-56

Area and gin	Predominant harvesting method	Percentage of seed					
		1951	1952	1953	1954	1955	1956
Oklahoma							
Southwestern							
Gin No. 1	Snapped	40.3					
Gin No. 2	Snapped	39.9					
Texas							
Lower Rio Grande Valley							
Gin No. 1	Picked	56.7	54.5	55.4			
Gin No. 2	Picked			56.7			
Coastal Bend Area							
Gin No. 3	Snapped		41.9	40.2	45.6	41.2	
California							
San Joaquin Valley							
Gin No. 1	Picked	54.5	54.9	55.3	57.4	57.0	55.8

Percentages of cottonseed in seed cotton varied between years at the same gins (table 11). These differences ranged from 2.2 percent at Texas Gin No. 1 between 1951 and 1954 to 5.4 percent at Texas Gin No. 3 between 1953 and 1954. The percentages of seed also varied from year to year at California Gin No. 1 with the largest difference between 1951 and 1954. These variations, together with changes in the amount of seed cotton required for a 500-pound bale mean substantially different amounts of seed per bale.

During Ginning Season

> Percentages of cottonseed in seed cotton provided a better than average base for estimating seed weights of cleanly harvested cotton but variations seemed excessive when there was considerable trash. Percent of seed declined somewhat as the ginning season advanced; pounds of seed cotton and pounds of cottonseed per 500-pound bale increased.

Divisions of bales by percentage of cottonseed for parts of the season eliminated some of the differences encountered in an entire season. The bales at Texas Gin No. 2 and Oklahoma Gin No. 1 were divided into five equal-volume groups for study.

Average percentages of cottonseed in the seed cotton were rather constant on the first four groups at Texas Gin No. 2 (table 12) and the first two groups at Oklahoma Gin No. 1. However, the general trend at both gins was downward.

Pounds of seed cotton required for a 500-pound bale increased throughout the season at both gins. This meant that different bases applied to the percent cottonseed. Pounds of cottonseed per 500-pound bale also increased for most of the season (table 12). The decline toward the end of the season can be attributed to rougher harvesting and perhaps immature bales.

Variations from the average on half the bales were comparatively low in the earlier groups at Texas Gin No. 2 but increased on the later groups, and averaged 90 pounds per bale for the last group. Variations were higher at Oklahoma Gin No. 1 than at Texas Gin No. 2 in the three earlier groups but nearly the same in later groups.

By Percent-Lint Groups

> Grouping bales by percent-lint groups rather than equal-volume groups might result in slightly more accurate estimates. However, large variations on a substantial part of the bales, together with problems of establishing current relationships of turnouts and percent of seed, seemed to restrict if not eliminate this as a practical base for estimates.

As seasons progressed, increases in trash reduced the accuracy of estimated seed weights based on percentages of seed in seed cotton. The question was: Would the grouping of bales by percent of lint and the average percent of cotton seed in seed cotton improve the accuracy of such estimates? Groupings were made to check it.

The average percent of cottonseed in seed cotton declined gradually

with decreases in percent-lint turnout at Oklahoma Gin No. 1 and Texas Gin No. 2 (table 13). Seed cotton required for a 500-pound bale and average seed per bale increased at both gins as percent lint declined.

Minimum variations above and below the average on half the bales were reduced slightly on some lint-percent groups as compared with the equal volume groups (tables 12 and 13). However, the variation from the average widened at both gins as percent-lint declined.

Table 12. - Average percent of cottonseed in seed cotton, seed cotton required per bale, estimated cottonseed and variations, by five equal-volume groups, Texas Gin No. 2, 1953 and Oklahoma Gin No. 1, 1951

Equal volume groups	Bales ginned	Average percent cottonseed in seed cotton	Average seed cotton required per 500-lb. bale	Estimated average cottonseed per 500-pound bale	Minimum variations above and below av.on half of bales
	Number	Percent	Pounds	Pounds	Pounds
Texas Gin No.2					
1st 20 percent	1,100	57.6	1,337	770	22
2nd 20 percent	1,100	57.4	1,420	815	32
3rd 20 percent	1,100	57.4	1,497	859	27
4th 20 percent	1,100	57.1	1,534	876	53
5th 20 percent	1,100	53.7	1,592	855	90
Total or average	5,500	56.7	1,471	835	51
Oklahoma Gin No.1					
1st 20 percent	412	42.7	2,016	861	43
2nd 20 percent	412	42.2	2,049	865	56
3rd 20 percent	412	41.4	2,101	870	47
4th 20 percent	412	39.6	2,174	861	55
5th 20 percent	412	35.5	2,381	845	84
Total or average	2,060	40.3	2,137	860	67

Table 13. - Average percent of cottonseed, seed cotton required, and estimated seed per bale variations, by five lint-percent groups, Texas Gin No. 2, 1953, and Oklahoma Gin. No. 1, 1951

Percent-lint groups	Bales ginned	Average percent of cottonseed in seed cotton	Average seed cotton required per 500-pound bale	Estimated cottonseed per 500-pound bale	Minimum variations above and below average on half of bales
	Number	Percent	Pounds	Pounds	Pounds
Texas Gin No. 2					
37.0 and over	960	57.9	1,312	760	19
35.0 - 36.9	1,400	57.8	1,393	805	27
33.0 - 34.9	1,380	57.5	1,471	846	28
31.0 - 32.9	960	57.1	1,558	890	33
Under 31.0	800	50.8	1,761	895	103
Total or average	5,500	56.7	1,471	835	51
Oklahoma Gin No. 1					
27.0 and over	117	45.8	1,767	810	53
25.0 - 26.9	423	43.1	1,938	835	38
23.0 - 24.9	726	41.5	2,083	864	43
21.0 - 22.9	478	38.7	2,262	875	51
Under 21.0	316	34.2	2,591	886	73
Total or average	2,060	40.3	2,137	860	67

When the amount of trash varied widely and accounted for a substantial percent of seed cotton, the percent of cottonseed was not an accurate base for use in estimating seed weights. The average percent of seed for some growers differed widely from the gin average. There was no evidence that ginning a large number of bales improved the relationship between the individual's average and that of the gin.

Cottonseed as a percent of seed cotton varied for 17 individual growers at Texas Gin No. 3, (table 14). The differences might seem small at first, however, since the percentages applied to different pounds of seed cotton per bale the differences in pounds of seed were larger than they appeared in some cases.

A larger number of bales does not bring the average percent of seed in seed cotton for individual growers closer to the gin average. Table 14 lists growers in order of the number of bales ginned in 1952. The number of bales, as well as the percentage of cottonseed, varied from year to year.

Differences between the gin average and that of some individual growers were substantial. For example, in 1953 Grower J had 3.4 percent more seed per bale than the gin averaged, close to the same percent as the gin in 1952 and 1.9 percent less than the gin in 1954.

More detailed examination of information on four growers who patronized Texas Gin No. 3 showed a similar pattern (table 15). These four growers ginned from 25 to 100 bales in 1954 but there was no evidence that larger numbers of bales caused the average percent of seed to more closely approach the gin average.

If the average percentage of seed for each grower had been used to estimate the seed in his bales, scale weights would have been missed by more than 45 pounds for Grower 1 and 112 pounds for Grower 4 on half of their bales (table 15).

Table 14. - Average percent of cottonseed in seed cotton on bales ginned by 17 individuals and gin averages, Texas Gin No. 3, 1952-1954

Growers	Average percent of cottonseed			Number of bales ginned		
	1952	1953	1954	1952	1953	1954
A	41.1	40.2	42.5	8	7	10
B	41.6	40.9	46.6	9	5	10
C	39.4	38.8	44.3	10	7	40
D	39.6	42.2	43.8	17	10	21
E	41.4	40.8	44.9	17	11	29
F	42.0	41.3	42.3	18	11	16
G	40.1	42.2	43.4	21	14	9
H	41.6	36.1	49.6	23	10	27
I	43.2	40.1	44.8	23	14	21
J	42.0	43.6	43.7	29	12	31
K	41.5	42.3	43.6	30	14	10
L	40.9	40.0	45.7	38	16	13
M	40.8	40.2	44.0	54	35	63
N	43.0	41.0	45.1	87	39	63
O	42.3	40.7	43.2	90	38	62
P	41.9	40.9	43.7	97	67	106
Q	42.3	37.4	49.1	138	52	100
Gin Average	41.9	40.2	45.6	-	-	-
Number of bales included in gin averages	-	-	-	978	633	2,617

Table 15. - Average percent of cottonseed in seed cotton, seed cotton required per bale, estimated seed and minimum variations for four individual growers, Texas Gin No. 3, 1954

Selected growers	Bales ginned	Average percent of cottonseed in seed-cotton	Average amount of seed cotton required per 500-pound bale	Estimated cotton-seed per bale	Minimum variations above and below average on half of bales
	Number	Percent	Pounds	Pounds	Pounds
Grower 1	25	42.4	1,960	830	45
Grower 2	50	42.7	1,780	760	22
Grower 3	79	43.4	2,120	920	36
Grower 4	100	49.2	1,770	870	112
Gin total or average	2,617	45.6	1,820	830	71

VARIATIONS IN TRASH AS PERCENTAGE OF SEED COTTON

Trash or foreign matter is seldom, if ever, weighed at cotton gins. Some indirect approach could be used, however, to estimate or figure its weight. For example, if trash is a constant percent of the weight of seed cotton, the bale weight and computed trash weight could be deducted from scale weight of seed cotton to derive the weight of seed.

The following sections discuss percentages of trash by volume groups during ginning season and trash by percent-lint groups.

During Ginning Season

Percent of trash, even if it could be computed during the ginning season, was a poor basis for estimating seed weights.

The percent of trash in seed cotton and also the pounds of trash increased at both Texas Gin No. 2 and Oklahoma Gin No. 1 during the season (table 16). The average amount of seed cotton required per 500-pound bale also increased. Residual pounds of cottonseed per bale increased for more than half the season, but declined during the last two 20-percent groups at Oklahoma Gin No. 1 and the last volume-group at Texas Gin No. 2.

Table 16. - Average percent trash in seed cotton, seed cotton required, estimated trash per bale, seed left, and variations, by 5 equal-volume groups, Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Equal volume groups	Bales ginned	Average percent of trash in seed cotton	Average seed cotton required per 500-pound bale	Estimated average trash per bale	Residual cottonseed per bale	Minimum variation above and below average on half of bales
	Number	Percent	Pounds	Pounds	Pounds	Pounds
Texas Gin No.2						
1st 20 percent	1,100	5.0	1,337	67	770	40
2d 20 percent	1,100	7.4	1,420	105	815	40
3d 20 percent	1,100	9.2	1,497	137	859	47
4th 20 percent	1,100	10.3	1,534	159	876	47
5th 20 percent	1,100	14.9	1,592	237	855	127
Gin total or average	5,500	9.3	1,471	136	835	76
Oklahoma Gin No. 1						
1st 20 percent	412	32.5	2,016	656	861	60
2d 20 percent	412	33.4	2,049	684	865	70
3d 20 percent	412	34.8	2,101	731	870	70
4th 20 percent	412	37.4	2,174	814	861	73
5th 20 percent	412	43.5	2,381	1,036	845	105
Gin total or average	2,060	36.3	2,137	777	860	95

Minimum variations above and below averages increased as the season advanced and were especially large on the fifth group at both gins. These wide variations reflect differences in the trash content of individual bales within the five volume groups.

By Percent-Lint Groups

> The relationship of percent trash and percent lint would be close enough on high-turnout picked cotton to provide a base equal to some of the others for estimating weight of seed. However, differences seem excessive where the trash per bale differs widely and accounts for a large proportion of seed cotton weights. These wide variations and lack of availability of accurate data on percentages of trash indicate this would be a poor base for estimating seed weights.

Trash and percent lint would be expected to have some relation. If that relationship were close enough, it might provide a good base for estimating the weight of seed.

This study showed a fairly close relationship on the first four percent-lint groups at Texas Gin No. 2 (table 17), but the minimum variation of 143 pounds on half the bales in the lowest turnout group was exceedingly high. That group included about one-seventh of the volume ginned that season. Minimum variations on half the bales at Oklahoma Gin No. 1 seemed excessive on all turnout groups.

Both the percent of trash and the pounds per bale increased as percent lint decreased, as did pounds of seed cotton required in a 500-pound bale. Residual pounds of cottonseed were higher for each successively lower percent-lint group.

INFLUENCE OF VARIETY

> Ginning a single variety of cotton did not keep seed-lint ratios from fluctuating within a year or from year to year. Seed-lint ratios differed widely at gins in the same area ginning the same variety of cotton in the same season. Seed-lint ratios at a one-variety gin were not the same for succeeding years.

The fact that the cotton ginned was of more than one variety might have caused some of the differences in seed-lint ratios at the Texas and Oklahoma gins. Therefore, data on single varieties were examined.

Published reports on cotton variety tests of various experiment stations give percentages of lint, but few include information on percentages of cottonseed. Percentages of lint frequently fluctuate from year to year, according to these reports.

Table 17. - Average percent of trash in seed cotton, seed cotton required, trash and seed per bale, and minimum variations, by five lint-percent groups, Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Percent-lint groups	Bales ginned	Average trash in seed cotton	Average seed cotton required per 500-pound bale	Estimated average trash per 500-pound bale	Residual cotton-seed per 500-pound bale	Minimum variation above and below average on half of bales
	Number	Percent	Pounds	Pounds	Pounds	Pounds
Texas Gin No.2						
37.0 and over	960	4.0	1,312	52	760	24
35.0 - 36.9	1,400	6.3	1,393	88	805	27
33.0 - 34.9	1,380	8.5	1,471	125	846	33
31.0 - 32.9	960	10.8	1,558	168	890	31
Under 31.0	800	20.8	1,761	366	895	143
Gin total or average	5,500	9.3	1,471	136	835	76
Oklahoma Gin No. 1						
27.0 and over	117	25.9	1,767	458	809	36
25.0 - 26.9	423	31.0	1,938	603	835	40
23.0 - 24.9	726	34.5	2,083	719	864	46
21.0 - 22.9	478	39.2	2,262	887	875	54
Under 21.0	316	46.5	2,591	1,205	886	92
Gin total or average	2,060	36.3	2,137	777	860	95

In tests of Deltapine cotton at the Experiment Station in Oklahoma, hand-picked cotton was handled so carefully that no deduction was made for trash. However, there was over 4 percent difference in seed between 1944 and 1945, (table 18). The seed-lint ratios showed a difference of 0.26 or 130 pounds on a 500-pound bale between 1941 and 1944.

Seed in snapped cotton differed by 3.8 percent between 1941 and 1943. Variations in seed-lint ratios were approximately the same as on the hand-picked cotton, or 130 pounds per 500-pound bale.

Other varieties showed differences similar to those on Deltapine, but with somewhat individual patterns. Thus, even under carefully controlled experimental conditions, percentages of lint and seed and seed-lint ratios varied from year to year.

Data on several California gins were included in earlier sections of this discussion. It was noted that wide differences occurred at a given gin in that one-variety area from year to year, between nearby gins in a given year, and at a given gin during a season.

These differences indicate that variety alone does not control percentages of lint seed and trash or seed-lint ratios so as to keep them constant. While the variations within a season for a single variety by bales or for different growers are not available for analysis, they would probably be as wide as those examined.

COMPARATIVE ACCURACY OF ESTIMATING BASES

> Cottonseed as a percent of seed cotton was the most accurate base for estimating cottonseed weights on clean cotton, but was very inaccurate on trashy cotton. Seed-lint ratios were the most consistent base for estimating seed weights. However, they involved such wide variations that they could not be considered generally satisfactory.

Seed-lint ratios, percentage of seed, percentage of trash, and relationships of lint turnouts to the other bases have been discussed separately with limited cross references. Examples will now be brought together and comparisons made.

Cottonseed as a percent of seed cotton gave the lowest minimum variation for the first three of the 20-percent volume groups at Texas Gin No. 2 (table 19). However, the minimum variations on that base exceeded the variations on seed-lint ratio for both the fourth and fifth volume groups. Variations on the seed-lint ratio were slightly lower than variations on trash for the first three groups and the lowest of the three on the fourth and fifth groups.

Minimum variations were lowest on seed-lint ratios on all five volume groups at Oklahoma Gin No. 1 (table 19). Variations on the basis of trash were very high at that gin. There appears no reason to consider estimating

Table 18. - Percent lint, seed, and trash, and seed-lint ratios of Deltapine cotton in Oklahoma Variety Test, 1941 and 1943-45 1/

Year	Hand picked			Hand snapped			
	Percent lint	Percent seed	Seed-lint ratio	Percent lint	Percent seed	Percent trash	Seed-lint ratio
1941	39.1	60.9	1.56	29.5	45.9	24.6	1.56
1943	41.4	58.6	1.42	29.9	42.1	28.0	1.41
1944	43.5	56.5	1.30	32.5	42.3	25.2	1.30
1945	39.4	60.6	1.54	29.4	45.1	25.5	1.53

1/ Source: Compiled from following publications of Oklahoma Agricultural Experiment Station; "Cotton Variety Tests in Oklahoma", Misc. Pub. No. MP-4, p.11, by Dunlavy, Henry, et al.
"1943 Cotton Variety Tests in Oklahoma", Mimeo. Circular No. M-109, by Dunlavy, Henry, et al. No page numbers, Section: Tipton Test, "Oklahoma Cotton Variety Tests for 1944 and 1945", by Dunlavy, Henry, et al,Mimeo. Cir. No. M-157, Tables 5 and 7.
"Oklahoma Cotton Variety Tests" by I.M. Parrott et al, Tech. Bul. No. T-37, pp 17-18.

by either percent seed or percent trash where conditions are similar to those in Southwestern Oklahoma.

When percent lint was related to seed-lint ratios, percent seed, and percent trash, the percent cottonseed made a good showing on high turnout but a poor showing on the lowest turnouts at Texas Gin No. 2 (table 20). The variations on percent trash in relation to turnouts were similar to those for percent cottonseed. While the variations on seed-lint ratios were not always the lowest on the volume groups at this gin, they were the most consistent and were the lowest for the season.

Seed-lint ratios were also the most consistent and averaged lowest for the entire season at Oklahoma Gin No. 1 (table 20).

Minimum variations were slightly lower when seed-lint ratios and percent turnouts were related than they were when bales were grouped by volume (tables 19 and 20). However, as stated earlier in this report, this is not a practical method for ginners to use.

On the whole, seed-lint ratios seem the best base being used to esti-

Table 19. - Comparative accuracy of selected bases used for estimating seed weights, by five consecutive equal-volume groups, Texas Gin No. 2, 1953, and Oklahoma Gin No. 1, 1951

Equal volume groups	Bales ginned	Estimated cottonseed per 500-pound bale	Minimum variations above and below average on half of bales, estimated by:		
			Seed-lint ratio	Cotton-seed as percent of seed cotton	Trash as percent of seed cotton
	Number	Pounds	Pounds	Pounds	Pounds
Texas Gin No.2					
1st 20 percent	1,100	770	30	22	40
2d 20 percent	1,100	815	40	32	40
3d 20 percent	1,100	860	45	27	47
4th 20 percent	1,100	875	40	53	79
5th 20 percent	1,100	855	45	90	127
Gin Average	5,500	835	45	51	76
Oklahoma Gin No.1					
1st 20 percent	412	860	40	43	60
2d 20 percent	412	865	50	56	70
3d 20 percent	412	870	45	47	70
4th 20 percent	412	860	45	55	73
5th 20 percent	412	845	45	84	105
Gin Average	2,060	860	45	67	95

Table 20. - Comparative accuracy of selected bases used for estimating seed weights by five percent-lint groups, Texas Gin No. 2, 1953 and Oklahoma Gin No. 1, 1951

Percent-lint groups	Bales ginned	Estimated cottonseed per bale	Minimum variation above and below average on half of bales when estimated by:		
			Seed-lint ratio	Cottonseed as a percent of seed cotton	Trash as a percent of seed cotton
	Number	Pounds	Pounds	Pounds	Pounds
Texas Gin No.2					
37.0 or more	960	760	25	19	24
35.0 - 36.9	1,400	805	30	27	27
33.0 - 34.9	1,380	846	30	28	33
31.0 - 32.9	960	890	30	33	31
Under 31.0	800	895	45	103	143
Gin total or average	5,500	835	45	51	76
Oklahoma Gin No. 1					
27.0 or more	117	809	40	53	36
25.0 - 26.9	423	835	40	38	40
23.0 - 24.9	726	864	45	43	46
21.0 - 22.9	478	875	50	51	54
Under 21.0	316	886	50	73	92
Gin total or average	2,060	860	45	67	95

mate seed weights, especially where some bales of seed cotton contain considerable trash.

It appears, however, that a better method than any of the bases examined should be available or developed. When seed is $60 a ton, 35 pounds of cottonseed are worth over $1. Variations of over 35 pounds occurred so frequently among growers included in this analysis that about one-fourth of them would have lost that amount or more if cottonseed weights had been estimated on the basis of accurate averages for the season. Use of estimated averages would more than likely increase the differences between estimated weights and scale weights.

RESULTS OF ESTIMATING COTTONSEED WEIGHTS

If ginners use overly conservative ratios or percentages when estimating cottonseed weights, marketing costs increase for the growers. If ginners use too liberal formulas in their estimates, they risk unpredictable losses on cottonseed weights.

Growers are displeased if a ginner uses a rather conservative formula, such as a 1.5 seed-lint ratio and scale weights indicate a 1.7 seed-lint ratio. But ginners cannot afford to use a 1.7 seed-lint ratio when the oil mill weights show 1.5 or even 1.6.

Even when a ginner selects a formula that corresponds with scale weight of the seed or calculates an accurate average after the close of the season, as some cooperative gins do, the problem of differences between average seed per bale of growers remains.

Risk to Ginners

> This study indicated that ginners assume a serious financial risk when they buy seed on estimated weights and sell on scale weights.

The extent of the loss a ginner may incur depends on average loss per bale, number of bales ginned, and price of cottonseed. The variations of seed weights found in this study indicated that ginners frequently underestimated or overestimated average weights by 30 to 35 pounds a bale or more. Even when bases were computed within the season, such losses could occur.

When seed is $60 a ton, an average loss of 30 to 35 pounds a bale would amount to about $1 a bale. A loss of $1 a bale would mean a considerable sum in the course of a ginning season.

If a ginner uses a conservative formula for estimating seed weights, he may find that competitors are using a more liberal formula and that he is losing volume. If a group of ginners in an area use or agree to use the same formula, they may find other ginners refuse to conform or they may encounter some other kind of reaction.

Uncertainties involved in buying seed on estimated weight and selling on scale weights prevent the ginner from securing an accurate check on the results of his operation until the end of a season. This uncertainty adds to cost of operation and must be considered when a ginner selects a formula for estimating seed weights.

Differences in Prices Quoted and Paid Growers

> When seed weights were estimated by an average seed-lint ratio and the price of seed was quoted at $60 a ton, the price growers actually received, based on scale weights, differed by as much as $10 a ton at a given gin.

Whether or not the ginner and his patrons, as a group, break even on estimated weights compared to scale weights, differences exist in prices paid to individual growers for cottonseed. These differences amount to more than might be expected.

Growers who have considerably more seed than estimated by the gin lose several dollars a ton. For example, Grower J, in Table 21, received $8 a ton less than the quoted price or than that received by Grower A, and $10.40 less a ton than Grower C. He would have received $3.60 less a bale on scale weights than indicated by the quoted price.

Ginners, in effect, pay lower prices to growers who have more seed per bale than indicated by the estimated seed weight. They pay premiums to growers who have less than the estimated average. These out-of-balance payments cannot be avoided if weights are estimated.

Losses and Gains per Bale and per Grower

> Losses or gains at a Texas gin amounted to over $2.50 a bale and $100 a grower in some cases. If the seed-lint ratio had been rounded to the next lower tenth, as a ginner might have done for self-protection, over one-half the growers would have lost 50 cents or more a bale and $5 or more on their crop.

If a ginner happens to select the figures for an estimating formula that give the same total as scale weights, neither he nor the growers as a group would lose or gain. In case of cooperative gins, the same result would occur when settlements were made at the end of the season. However, in either case, individual growers could have gained or lost over $2.50 a bale at Texas Gin No. 3 in 1954 (table 22).

If 1.65 -- the average ratio of the 71 growers from scale weights of seed -- had been used, 29 growers would have gained over 50 cents a bale and 24 would have lost over 50 cents a bale. That ratio was determined from all the bales and even though the total gains and losses were equal, the number of individual growers who lost or gained was not equal since

Table 21. - Examples of differences in prices growers would receive based on average seed-lint ratio of gin, Texas Gin No. 3, 1953

Growers	Average seed-lint ratio from scale weights	Average cottonseed per 500-pound bale		Amount grower would have received per bale at $60 a ton		Price grower actually received per ton on scale weights when seed was estimated by gin ratio	Difference above (+) and below (-) average gin price per ton
		By scale weights	By seed-lint ratio for gin	By gin ratio	By scale weight		
		Pounds	Pounds				
A	1.58	790	790	$23.70	$23.70	$60.00	0
C	1.52	760	790	23.70	22.80	62.40	+ $2.40
J	1.82	910	790	23.70	27.30	52.00	- 8.00
L	1.62	810	790	23.70	24.30	58.60	- 1.40
N	1.54	770	790	23.70	23.10	61.60	+ 1.60
Gin average	1.58	790	790	$23.70	$23.70	$60.00	—

Table 22. - Distribution of gains and losses 71 growers would have taken, per bale, had Texas Gin No. 3 used seed-lint ratios instead of seed scales in 1954

Gains and losses per bale at designated class intervals	Number of growers	
	With 1.65 ratio 1/	With 1.6 ratio 2/
+$2.51 and over	2	None
+ 1.51 to + 2.50	10	4
+ 0.51 to + 1.50	17	11
- 0.50 to + 0.50	18	18
- 0.51 to - 1.50	15	18
- 1.51 to - 2.50	5	15
- 2.51 and over	4	5
Total	71	71

1/ Average for 71 growers from scale weights

2/ As might be estimated.

they ginned various numbers of bales. A ginner under these conditions would more likely have used a ratio of 1.6.

If 1.6 ratio had been used, 38 instead of 24 of the 71 growers would have lost over 50 cents.

Total gain or loss of an individual grower is influenced by (1) relation of the base used to the average base for the period; (2) how close the average ratio or other base of the individual is to the ratio or other base used by the gin; and (3) the number of bales the grower gins.

The data on individual growers in the preceding section did not show any tendency for average seed-lint ratios of larger growers to approach closer to the average of the gin than those of small growers. Neither was there any noticeable tendency for the value of the seed of the 71 growers to come closer to the gin average as the number of bales ginned increased.

The gain or loss on weight of seed from the bales ginned in a season is of primary concern to individual growers. If the average ratio of 1.65 from scale weights for the 71 growers had been used in 1954, individual gains and losses for the season would have ranged from over $100 gain to over $200 loss (table 23). The largest gain and loss would have been $168 and $225, respectively. If a ratio of 1.6 had been used, the gains or losses per individual would have ranged from a gain of over $50 to a loss of over $200. The largest gain or loss in the latter case would have been $89 and $265.

Approximately 4 out of 5 growers would have gained or lost over $5 on the bales they ginned if the gin had used the average ratio of 1.65. Thirty growers would have lost over $5 each. If a 1.6 ratio had been used, 38 -- or over one-half of the total number -- would have lost more than $5.

Estimating Weights at Cooperative Gins

> Losses and gains on seed weights at cooperative gins are not offsetting, as is sometimes assumed. Inequities arising from estimated weights are compounded in final settlements with members rather than averaged out or eliminated.

It is sometimes assumed that variations between estimated and scale weights do not make any important difference at cooperative gins. That belief apparently rests on the theory that differences are averaged out and equity prevails following patronage refunds by the cooperative gin. Since the cooperative gin pays the members, as a group, what it gets for seed, no problems are thought to exist. However, in view of the variations found between seed of individual growers in this study, it seemed that the degree of equity that prevails needed to be checked. The gin pays out the same amount of patronage refunds whether the seed is weighed or estimated, but some growers receive too much while others receive too little on estimated weights.

Table 23. - Distribution of gains and losses of 71 individual growers on bales ginned in season had 1.6 and 1.65 seed-lint ratios been used at Texas Gin No. 3, 1954

Gains and losses Variable class intervals (Dollars)	Number of growers	
	With 1.65 ratio	With 1.6 ratio
Over + 200	None	None
+ 100.00 to + 200	4	None
+ 50.01 to + 100	7	4
+ 25.01 to + 50	9	7
+ 5.01 to + 25	6	6
0 to + 5	9	3
- 0.01 to - 5	6	13
- 5.01 to - 25	17	14
- 25.01 to - 50	3	8
- 50.01 to - 100	8	6
- 100.01 to - 200	1	8
Over - 200	1	2
Total	71	71

Table 24, shows what actually happens at a cooperative gin in the initial payment and after patronage refunds, when seed is estimated, as compared to weighing the seed from each bale. A seed-lint ratio of 1.6 was used in estimating seed per 500-pound bale. The estimated seed weight averaged 800 pounds a bale for each grower. These growers, however, actually had various average amounts of seed per bale according to scale weights.

The estimated 800 pounds of seed per bale was worth $24 at $60 a ton. The pounds of seed by scale weights varied from 700 to 900 pounds a bale and the value at $60 a ton ranged from $21 to $27.

The refund of $4 a ton averaged $1.60 on the estimated 800 pounds of seed per bale for all five growers. On the basis of scale weights, however, the patronage refund would have varied from $1.40 to $1.80 per bale. Any other patronage refund higher or lower than $4 a ton would have given similar results.

Each grower (table 24) would have received $25.60 a bale as the total returns for cottonseed, including patronage refunds, on the basis of estimated weights. On the basis of scale weights, the total amount received for seed by the individual growers would have ranged from $22.40 to $28.80.

Grower A would have received $3 more on estimated weights than on the value of the weighed seed at the time the cotton was ginned. After patronage refunds, Grower A would have received $3.20 more on estimated weights than on scale weights. On the other hand, Grower E received $3 less than the value of his seed at the time the cotton was ginned, but $3.20 less after the patronage refund was distributed, as a result of estimating rather than weighing the seed.

SEED SCALES

> This study indicated that since none of the bases commonly used in estimating seed weights are constant, seed scales are necessary for accuracy and equity. It is estimated that 10 to 20 cents a bale would cover the cost of weighing seed at gins.

Cottonseed scales seem the alternative to the losses and problems arising from inaccurate methods of estimating cottonseed weights. The cost of such scales and of their operation is a pertinent question since expenses must be charged against benefits. Their accuracy should also receive consideration.

Cottonseed scale weights on individual bales used in this discussion were obtained from gins with the standard bale capacity, double-hopper cottonseed scale sold by gin machinery manufacturers and used at some gins for many years. In recent years, three new types of scales have appeared on the market.

Table 24. - Comparison of effects of estimated and scale weights on returns to growers at cooperative gins

Growers	Average weight of seed per bale		Value of seed per bale @ $60 a ton when ginned		Patronage refund on seed at rate of $4 a ton		Total amount received per bale for cottonseed	
	Estimated	By scales	By estimated weights	By scale weights	By estimated weights	By scale weights	Estimated weights	Scale weights
	Pounds	Pounds						
A	800	700	$24.00	$21.00	$1.60	$1.40	$25.60	$22.40
B	800	750	24.00	22.50	1.60	1.50	25.60	24.00
C	800	800	24.00	24.00	1.60	1.60	25.60	25.60
D	800	850	24.00	25.50	1.60	1.70	25.60	27.20
E	800	900	24.00	27.00	1.60	1.80	25.60	28.80
Total	4,000	4,000	$120.00	$120.00	$8.00	$8.00	$128.00	$128.00

1. Wheel meter

2. Conveyor belt

3. Automatic small hopper.

These scales are listed at prices ranging from less than $1,000 to more than $5,000 f.o.b. Installation and operating costs will likely vary according to conditions at individual gins.

Data are not available for analyzing total costs of weighing cottonseed. However, it appears from observation that most gins would find the cost reasonable. Total cost of weighing cottonseed might amount to 10 to 20 cents a bale. The risks to gin operators and the losses to some farmers when seed weights are estimated may be considerably more costly than the expense of using cottonseed scales.