


**UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE**



**SWEET CORN
FOR
PROCESSING**

INSPECTION INSTRUCTIONS

June 1962

FOR USE OF FRESH FRUIT AND VEGETABLE INSPECTORS

**FRUIT AND VEGETABLE DIVISION
FRESH PRODUCTS STANDARDIZATION AND INSPECTION BRANCH
WASHINGTON, D. C.**

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INSPECTION HANDBOOK FOR
SWEET CORN FOR PROCESSING 1/

INTRODUCTION

This handbook sets forth the approved procedure for sampling and grading loads of sweet corn intended to be used for processing. (1)
Instructions dealing with the authority, responsibility and conduct of an inspector will be found in the general shipping point inspection handbook.

INSPECTION EQUIPMENT

Certificates. (2)
Several 2-bushel sample baskets or comparable containers.
Platform scales for weighing samples.
One or more scales for weighing graded ears.
Baskets or metal tubs for weighing graded ears.
Slide rule or percentage computation chart.
Washable coat.
Pail or basin for water to rinse hands.
Paper towels.
Grading table.

Recommended specifications for a corn grading table are: height, 36 inches; length, 54 inches; width, 36 inches. The table top should be slatted rather than solid, so that particles and scraps can fall through the spaces about 1 inch wide between the slats. Boards about 6 inches wide standing on edge and fastened across the back and each end of the table prevent the ears from falling off. Four sections or bins are created by fastening three additional boards on edge to the top of the table extending from the back board to near the front of the table. Bin No. 1 at the left should be about 12 inches wide, bin No. 2 about 24 inches, bin No. 3 about 12 inches, and bin No. 4 about 6 inches. The bins are left open at the front where the inspector stands while sorting the corn. (3)

The grading table may be built in the tip-top design commonly used for cannery tomato grading. This permits quick dumping of the graded ears into several weighing containers after they have been sorted. (4)

SAMPLING

Sampling from Pile. The sample should be drawn from the pile as the truck is being unloaded or after it has been unloaded. The sampler takes a one-hand grab sample at random without selecting any particular ears. He obtains several ears of corn and possibly a piece of stalk or (5)

1/ This handbook supersedes the "Shipping Point Inspection Handbook For Sweet Corn For Processing" dated August 1955.

leaf. Everything in his hand is placed in the 2-bushel sample basket. He then repeats the grab sampling at many different points over the pile. All long shanks, leaves, stalks, etc., which are picked up with the sample are kept in the sample to make it representative of everything in the load. The basket should be heaped with corn to obtain somewhat more than enough for the analysis sample. This will insure having 50 pounds in the sample when it is weighed.

- (6) Sampling from Loaded Trucks. The sample should not be drawn from the load while it is on the truck if it is possible to draw the sample after the load has been dumped from the truck. Obviously, a sample drawn from the upper part of the load while it is on the truck is likely to be less representative of the quality of the entire load than is a sample drawn after unloading. In case there is some very good reason for sampling before unloading, the sample should be taken as follows: Dig straight down in one spot, taking each ear or piece of stalk as it becomes available and putting them in the sample basket, making a hole about one foot in diameter and going as deep in the load as it is possible to reach. Repeat this procedure in several places scattered over the load until more than enough corn for the sample has been taken.
- (7) Sampling by Helper: Wherever possible, the inspector should draw his own sample. Where the volume of work is so heavy that it is necessary for the plant to assign a helper for drawing samples, the inspector must keep the sampler under his supervision to be sure that he obtains a representative sample and makes certain that each sample is correctly identified with the grower's name.
- (8) Prompt Sampling and Grading: The sample shall be drawn and graded as soon as possible after delivery of the load, unless other arrangements have been made with the Inspection Service by the processor. Prompt grading will avoid penalizing the grower for aging of the corn which is likely to progress fairly rapidly after delivery. If the processor does not use the inspection reports as a basis for purchasing the corn, but does use them as guides in processing, he may request that the inspections be made shortly before the corn is processed. Under this system, the sampling and grading may be delayed several hours or overnight.
- (9) The contracts of some processors set a time limit for delivery of corn at night. If loads come in after the deadline hour, the grower may be permitted to dump the load, but it is understood that it will not be sampled and graded until the following morning.

WEIGHING GRADE SAMPLE

- (10) A 50-pound sample is used for grade analysis in most cases. Smaller samples result in less representative grades, and should not be used except in cases of emergency or when requested by the processor and approved by the supervisor. The sample basket is placed on the platform scales with the counter weights set for 50 pounds plus the tare weight of the basket. Enough corn is removed from the top of the basket to balance the scales for an even 50-pound sample. Any portions of corn-

stalks, leaves and trash which are picked up with the ears when drawing the sample should be included proportionately in the weighed sample in order to more accurately reflect the composition of the load.

HUSKING

Removal of Husks: Usually a husking machine is set up near the inspection table for the exclusive purpose of husking inspection samples. (11)
In feeding the ears of corn to the machine, care should be used to place them on the conveyor so that the shanks will be cut off just below the base of the ear. It is important to obtain the entire ear in the sample but also to remove practically all of the stem or shank. All husks remaining should be removed by hand. At inspection points where husking machines are not available, the samples shall be husked by hand. If loads of corn are arriving at very frequent intervals, it may be necessary for the inspector to have help with the husking. Usually the processor will furnish such help on his own initiative; otherwise, he should be requested by the supervisor to do so.

Removal of Shank and Excess Tip: The U. S. Standards provide that ears in the analysis sample shall be completely husked. A husked ear (12)
is defined as one which, in addition to the removal of the husk, has been trimmed if necessary. If a portion of the shank or stem remains which extends more than one inch from the base of the cob, it shall be broken or cut off at a point as close as possible to, but not more than one inch below the base of the cob. If the upper end of the cob has an area without usable kernels which averages more than one-fourth of the length of the entire cob, then enough of the tip end of the cob shall be broken or cut off so that the portion remaining without usable kernels will be as nearly as possible one-fourth of the length of the cob.

ANALYSIS OF SAMPLE

The U. S. Standards for Grades of Sweet Corn for Processing are (13)
based on two classifications of the ears: one for general quality and grade, the other for maturity. Although it is intended that the results of the two classifications shall be reported individually, the determination of each should be made simultaneously as the sample is being sorted. However, for the sake of clarity, the procedures and interpretations for the two types of classifications are described separately.

The entire sample of husked ears are placed in the wide No. 2 bin (14)
of the grading table. They are then sorted, and each ear is examined individually to determine into which category it falls for grade and maturity.

QUALITY AND GRADE SEPARATION

Each ear is judged on the basis of the amount of its surface (15)
covered with usable corn, its uniformity of color, its degree of freedom from blemishes and the amount of trimming of kernels which would be required. On the basis of this judgment, the ear is placed in the

U. S. No. 1 grade, the U. S. No. 2 grade or the Cull bin. In the following paragraphs, the various factors of quality are discussed in detail.

- (16) Freshness. Both No. 1 and No. 2 grades require that the ears be fresh. If the corn has been picked for too long a time, it is likely to have lost sweetness, flavor and moisture, as well as tenderness of the pericarps. Lack of freshness is best detected before the sample is husked by an abnormal dryness and perhaps some discoloration of the ends of the stems where the ears were attached to the stalk. This condition should serve as a warning signal to check closely for advanced maturity in the form of tough pericarps and heavier consistency of the content of the kernels.
- (17) Dryness and blanching of the husks is not a reliable basis for deciding that the corn is not fresh. Very dry, hot weather may result in varying amounts of drying of the husks while the ears are on the stalks. Freshly picked ears may show this condition, but the butt ends will indicate that the corn is fresh and satisfactory for No. 1 or No. 2 grade as far as freshness is concerned.
- (18) Color of Kernels. The requirement of "similar color characteristics" is intended to rule out the mixing of varieties which contrast in color enough to detract from the appearance of the canned or frozen product. Normal variations in intensity of yellow color such as are commonly associated with different stages of maturity are not objectionable. Only when ears of sharply contrasting color are mixed in a lot, are they classed as culls.
- (19) Amount of Usable Kernels. Both U. S. No. 1 and U. S. No. 2 grades require a certain amount of usable corn on the ear; unless otherwise specified, at least four inches for No. 1 and 3 inches for No. 2, over and above what would be lost in a normal trimming operation. In determining the amount of usable corn on an ear, the average measurement should be used. For example, if an ear has only 3 1/2 inches of developed kernels on one side, but the boundary line of usable kernels slopes upward to a height of 6 inches on the other side of the ear, there will probably be an average of more than 4 inches covered, and the ear can meet No. 1 on this factor. A barren spot on the side of an ear should be taken into consideration in estimating the total area of the ear which is covered by usable corn.
- (20) Ears having worm or bird blemishes which are bad enough to need to be trimmed shall be judged on the basis of how many inches of usable kernels are left after the trimming which usually necessitates the removal of some good kernels along with the damaged ones. For example, an ear which has approximately 4 1/2 inches covered with kernels, but would need to have about 3/4 inch trimmed off the end to remove some badly discolored worm-eaten kernels on one side of the upper end, would probably not have the 4 inches of kernels required for No. 1 grade. (See par. 32 and 33 on worm and bird damage.)

Ears which are in the younger part of the milk stage may have a considerable area near the upper end where the kernels are bordering on or actually in the blister stage. There will be some difficulty in deciding on the point where the milk stage kernels end and the blister stage kernels begin. If the majority of the kernels on the ear have reached the milk stage, the ear shall not be barred from No. 1 grade even though some of the area making up the required 4 inches may be covered with blister stage kernels. (21)

Both the No. 1 and No. 2 grades permit certain percentages of cross-pollinated or dented kernels before the ear is classed as damaged or seriously damaged respectively. Therefore, an ear may have 2% cross-pollinated kernels or 4% dented kernels in its 4 inches of kernels which remain after any necessary trimming, and still be a No. 1 ear. Likewise, an ear may have 4% cross pollinated or 9% dented kernels in its 3 inches of kernels after trimming, and still be a No. 2 ear. (22)

Specification of Amount of Usable Kernels. The standards provide that the minimum average length of the ear covered with usable corn may be specified differently from the length specified in the No. 1 or the No. 2 grade or both. If some special length such as 4 1/2 or 5 inches is specified in the contract, the corn shall be graded on that basis. (23)

Freezing. There is very little likelihood that damage by freezing will be encountered. It can occur in the northernmost producing areas on late crops. A light frost usually causes some "burn" or blanching and drying of the outer layer of husks, but has little or no effect on the quality of the kernels. Only in case of heavy frost or hard freeze do the ears get cold enough for ice formation inside of the kernels. If freezing has caused the kernels to become pale in color, lose their luster and change in texture, the ear should be scored as damaged. (24)

Cross Pollination. The standards are specific in permitting 2 percent of cross pollinated kernels in No. 1 grade and 4% cross pollinated kernels in No. 2 grade. Only kernels which are sharply contrasting in color or which are overmature due to cross pollination should be included in these percentages. By counting twenty kernels in a row and five rows across, an accurate estimate can be made of the area occupied by 100 kernels. Based on the size of this area, it will be easy to estimate whether there are 2, 3, 4, 5 percent or more of the kernels affected by cross pollination. (25)

Denting. The development of dents or depressions on the outer exposed surface of kernels is a gradual process, and the size and depth of the depressed area is progressive. Denting is usually associated with advanced stages of maturity or "hard" corn. However, it sometimes develops at a fairly young stage of maturity, apparently as a result of lack of sufficient soil moisture. Only kernels with conspicuous (fairly deep) depressions should be included when determining whether they exceed the 4% permitted in No. 1 grade or the 9% permitted in No. 2. Percentages may be accurately estimated as described in the preceeding paragraph (cross pollination). (26)

- (27) Worm Damage. In some growers' lots in some areas, many ears are affected by worms. All ears which show holes eaten by corn borer larvae are excluded from both grades. They create a hazard of introducing insect fragments into the cut-off corn coming from the cutting machines. Corn ear worms, however, are removed during the husking or washing operations, and they create practically no problem of insect fragments in the finished product.
- (28) In many cases, the ear-worm eaten kernels are only slightly to moderately discolored, and do not necessitate trimming the ear. Such kernels are usually not noticeable in the cut-off corn. Ears of this nature are not classed as "damaged".
- (29) When the remnants of one or more worm-eaten kernels on an ear are badly discolored, the grading of the ear depends upon two factors: (1) where the bad kernels are located on the ear, and (2) how much usable corn will remain on the ear after a normal trimming operation.
- (30) If the badly discolored remnants are not more than one inch from one or the other end of the area covered by usable kernels, it is assumed that the ear may be trimmed easily by clipping off the end. Such an ear is not classed as "damaged". It is permitted in No. 1 grade if it will still have sufficient length covered with usable kernels after trimming to remove the discolored kernels. If it will not have enough usable kernels to meet the No. 1 grade requirement, it may meet the No. 2 grade; otherwise it will fall into the Cull classification.
- (31) An ear having badly discolored remnants of worm-eaten kernels located more than one inch from one or the other end of the area covered by usable kernels is automatically classed as "damaged" because of the greater amount of trimming involved. Such an ear is excluded from the No. 1 grade. However, it is permitted in No. 2 grade if it will have at least 3 inches of usable corn after the normal trimming necessary to remove the defective kernels. An ear which will not have sufficient surface covered with usable corn to meet No. 2 grade after the necessary trimming is classed as seriously damaged and is a Cull.
- (32) Trimming. The standards refer to the "usual method of trimming" for removing defective kernels. This means the methods used in the average processing plant, rather than the methods which might be used in home preparation. In removing defective kernels from an area near the end of the ear, the common practice is to remove all of the end of the ear, including the area affected, either by inserting the end of the ear into the rotary knife machine or by lopping it off with a hand knife. If the defective kernels are located far down the side of the ear, trimming is likely to be done with a hand knife by making one or more long "slab" cuts. In either case, it is usually necessary to cut off a considerable amount of good kernels in order to remove the defective ones. Determination of the amount of usable corn on the ear shall be based on what will be left after trimming by the methods described.

It will usually be possible to estimate quite accurately the amount of usable corn which would be left on the ear after trimming. So it will not be necessary to actually trim each defective ear when grading a sample. However, a few ears should be trimmed factory-style now and then to help the grader keep his sights in line. (33)

Bird Damage. Blackbirds or starlings sometimes congregate on corn fields and inflict very extensive damage. Many ears from such fields are pecked at the tips by the feeding birds. If the bird-pecked remnants of kernels are not dried or more than moderately discolored, they should be ignored, and the ear graded on the basis of the amount of good kernels on it. When the bird-pecked kernels are badly discolored or dried, the ear needs to be trimmed and shall be graded accordingly on the same basis as described under "Worm Damage" (par. 27 to 33). (34)

Fermentation. Corn on the ear occasionally becomes fermented or "sour". This condition can be due to excessive rainfall or penetration of the husks by birds or insects. Affected ears are likely to show some discoloration of the kernels, although the husks may look normal. If the ear has a definitely fermented or sour odor it is not permitted in either grade and is a Cull. (35)

Smut or Other Disease. Smut infected kernels are very objectionable in a processed pack. If a kernel has become enlarged to twice the size of surrounding normal kernels or if a smut gall kernel has broken, the ear shall be classed as a Cull. (36)

Other kinds of diseased kernels not specifically mentioned in the standards may be found. If so, the affected ears shall be graded on the basis of the general definitions of damage or serious damage. (37)

Mechanically Caused Defects. Most sweet corn for processing is harvested by mechanical pickers. As the ears pass through the parts of the machinery, a great many of them are slightly to moderately bruised. A few ears may be cut or broken. This is a natural, largely unavoidable result of machine picking. However, an excessively large number of badly mutilated ears indicates that the picker probably needs repairs or adjustments, and the facts should be called to the attention of the processor and the grower. (38)

Bruised ears usually show small areas of kernels which are slightly crushed but are fresh and not discolored. Very little if any waste is involved, and no trimming is required. Both the processor and grower take this slight injury for granted as a natural result of machine picking. Consequently, the standards do not mention mechanical injury, in order to avoid creating the impression that such ears should be classed as damaged. (39)

An ear which has been cut or broken in two by the machinery shall be allowed in the grade where it would have been placed if it had not been broken. In most cases, there will be enough of the ear left to permit a reasonably accurate determination. (40)

(41) If an ear has a defect caused by mechanical means at some time prior to picking, the injured area will show evidences of age to distinguish it from the usual fresh picker injuries. Such an ear should be judged on the basis of the general definitions of damage and serious damage to aid in placing it in No. 1 or No.2 grade or the Cull classification.

(42) Other Defects. Defects other than those resulting from causes mentioned in the foregoing paragraphs may be found. Any such defective ears shall be judged on the basis of the general definitions of damage or serious damage.

MATURITY CLASSIFICATION

(43) Classification of a load of corn for maturity is more important as a measure of its processing quality than is grade determination. It is extremely important for the corn to be as near as possible to the ideal stage of maturity for the type of processing intended.

(44) The maturity classification of a load is determined from the range in maturities of individual ears and the distribution of the individual ears within that range. As each ear in the grade sample is examined to determine its grade, a mental note is made of its stage of maturity. When all ears have been sorted for grade, the maturity appraisal will also be completed. For example, the ears may be mostly in the younger portion of the milk stage, with many in the older portion of the milk stage, but none close to the lower limit of the milk stage -- this lot would be classified as A-1.

(45) Maturity of Individual Ears. The standards recognize five different stages of maturity of individual ears: blister, milk, cream, dough and hard stages. Each stage is defined briefly in the standards. The blister stage is generally considered to be too young, and the hard stage too old to be suitable for any type of processing. Consequently, ears in either of those stages of maturity are excluded from both the No. 1 and No. 2 grades and are classed as Culls.

(46) Maturity determination is based primarily on the thumb nail test which is discussed in detail in the following paragraphs. The knife test, discussed in paragraphs 57 to 60 is an alternative method of determining maturity. Constant use of the thumb nail for testing ears frequently causes soreness or blisters at the end of the thumb. This condition makes the test painful, and tends to slow down the operation as well as to make the corn seem tougher than is actually the case. It is important to learn how to use the knife test and to make use of it to avoid unnecessary punishment to the thumbs.

(47) Thumb Nail Test. Breaking the kernels with the thumb nail serves to show both the degree of tenderness of the pericarps or skins and the consistency of the substance inside of the kernels. The ear should be tested at a point about midway of its length, approximately halfway up the ear from the butt end. This is where the most mature kernels on the ear are located.

Best results are obtained by clasping the butt end of the ear in the hand with the tip end extending upward past the thumb. The thumb is then bent inward so that it contacts the ear near its center at approximately right angles to the surface. Pressure is then exerted by a squeezing action of the hand which forces the thumb nail against the kernel. The direction of the pressure should be toward the ear but with a slight angle upward toward the tip end of the ear. The pressure is increased to the extent necessary to break the pericarp and cause the contents of the kernel to spurt out. (48)

Experience will enable a person to acquire a feel for the amount of pressure necessary to break the pericarps. The terms "slight", "moderate" and "heavy" pressure used in the definitions of "milk stage", "cream stage" and "dough stage" respectively are relative. They can be interpreted as intended only after some training and experience have developed a basis for good judgment. (49)

Judging the exudate squeezed out of the kernels broken by the thumb nail is the other factor in determining the stage of maturity of the ear. The various degrees of fluidity or thickness of the contents of the kernels at the various stages of maturity are described in the definitions in the standards. These definitions can be much more accurately interpreted after some training and experience. (50)

Milk stage ears, when the kernels are broken by the thumb nail, have an exudate which is fairly fluid and spurts out freely. The germs are usually soft and easily crushed between the thumb and finger. (51)

Cream stage ears, when "punched", have an exudate of a consistency of heavy cream which tends to spurt out in small gobs. The germs are usually moderately firm and can be crushed with only moderate pressure. (52)

Dough stage ears, when "punched", do not spurt to any extent, but the exudate tends rather to ooze out with a consistency comparable to that of tooth paste. The germs are firm and are difficult to crush. (53)

Hard stage ears, when "punched", have an exudate of a consistency approaching that of caulking compound which is difficult to squeeze out of the pericarp. The germs are hard. (54)

Temperature and moisture supply while the corn is growing affect the rate of toughening of the pericarps and the thickening of the contents of the kernels. The changes do not always progress at the same rate for both of these factors. Although both factors are considered in judging the maturity of an ear, it will frequently be necessary to place more weight on one of them. The factor which indicates a more advanced maturity shall be given greater weight, because it will probably be a more reliable indicator of what the corn will be like after processing. (55)

- (56) A high rate of speed can be developed in making the thumb nail test, and it can be done as the ears are sorted for quality and grade. When all of the ears have been graded, it will only be necessary to remember the range and distribution of maturities of ears in the lot.
- (57) Knife Test. The knife tests serves as a dependable substitute for the thumb nail test, once the technique has been mastered. Where a great many loads are being inspected daily, the knife test should be used extensively in order to avoid or at least relieve the problems caused by sore thumbs.
- (58) The test is made as follows: Use the same knife for all tests and keep the blade edge only moderately sharp. Keeping the same knife at the same degree of sharpness makes it easier to get the desired comparison in the feel of the cutting operation. Pick out a typical row of kernels near the center of the ear, and draw the knife blade across the centers of 6 to 10 kernels in the vertical row, cutting them deep down the center and dividing them approximately in half. Then crook the thumb against the lower end of the cut and force it upward, gouging out the contents of the kernels on the thumb nail.
- (59) The amount of pressure required to cut through the pericarps of the kernels with the knife is considered to be equally as good an indication of the toughness of the pericarps as is the amount of pressure required to puncture the pericarps with the thumb nail. However, some training and experience is needed to develop the desired amount of skill in judging and interpreting the amount of pressure used with the knife.
- (60) The exudate from the cut kernels which is collected on the thumb nail provides an excellent opportunity to judge its consistency. First, its thickness or fluidity can be observed. Second, the germs which have been squeezed out can be tested for tenderness. If simply looking at the exudate is not enough to warrant formation of a clear opinion, patting it with the finger or rubbing it between finger and thumb should help toward reaching a decision. (See paragraphs 51 to 54).
- (61) Maturity Classification of Load. It is usually not necessary to separate the ears on the basis of maturity. The hybrid varieties of corn grown for processing tend to mature uniformly - that is, all ears from a given field are usually very near the same stage of maturity. However, occasional loads may have so nearly an equal distribution of ears in the upper and lower halves of the milk stage as to make it difficult to determine whether the lot should be classed as A-1 or A-2. In such cases, it may be necessary to actually separate the early milk stage ears (upper half) from the late milk stage (lower half of the maturity stage) in order to determine whether more than half are in the early or younger half of the milk stage.

The procedure should be, after dumping the husked ears on the inspection table, to first determine whether more than 50 percent of the ears are in the early milk stage which would put the load in A-1 classification. After that determination has been made, the ears should be graded for quality, but the more mature ears should be left in the center compartment until the last. From these more mature ears, it can be determined that the load fits one of the maturity classification descriptions as follows: (62)

1. Five percent or less bordering on "cream stage"--A-2.
2. More than 5 percent bordering on "cream stage"--A-3.
3. One to 10 percent in the "cream stage"--A-B.
4. More than 10 percent in the "cream stage"--B.
5. One to 10 percent in the "dough stage"--B-C.
6. More than 10 percent in the "dough stage"--C.

In some instances, it will be necessary to weigh the ears in the most advanced stage of maturity before grading them for quality. This weight, divided by the total weight of usable ears, will give the percentage of ears in the most advanced stage.

WEIGHING SORTED EARS

When all ears have been sorted into the separate groups: No. 1, No. 2 and Culls, they are ready for weighing. If a tip-top grading table is used, the corn can be dumped all at once into three waiting containers. Otherwise, each group of ears will have to be picked up from the table separately for weighing. The weight should be recorded to the smallest fraction of a pound which can be read on the available scales. This may be low as a quarter of a pound, depending upon how the face of the scale is marked. (63)

CALCULATING PERCENTAGES

The percentages of husked ears may be calculated by one of two different methods, depending on the provisions of the contract governing the purchases. One method is to base the percentages on the weight of the sample before husking. For example, with a 50 pound sample and 30 pounds of No. 1 husked ears, 3 pounds of No. 2's, and 1/2 pound of culls, the percentages would be No. 1 60%, No. 2 6% and Culls 1% for a total of 67% of the sample. (64)

The other method is to base the percentages on the total weight of husked ears. Using the same example as given above, the total weight of husked ears (30, 6 and 1/2 pounds) is 36 1/2 pounds. This gives rounded off percentages of No. 1 82%, No. 2 17% and Culls 1% for a total of 100% of the husked ears. (65)

CERTIFICATE

(66)

Recommended Form. A special form of certificate should be prepared for reporting the results of inspections of sweet corn at processing plants. They should preferably be printed in triplicate or quadruplicate and serially numbered. If bound in a pad form, they will be handier to use and less likely to become mutilated or mixed up. A suggested form is shown below:

UNITED STATES DEPARTMENT OF AGRICULTURE
Department of Agriculture

SWEET CORN INSPECTION CERTIFICATE

Serial
Number

Buyer's Name _____

Place _____ Date _____

Grower's Name _____

Address _____

Buyer's weight of Load _____ Variety _____

ANALYSIS OF SAMPLE

Weight of sample in the husk _____ lbs.

	<u>Pounds</u>	<u>Percent</u>
U. S. No. 1 husked ears	_____	_____
U. S. No. 2 husked ears	_____	_____
Total usable husked ears	_____	_____
Cull ears	_____	_____

Maturity Classification _____

Remarks _____

I, the undersigned, on the date shown above, inspected samples drawn from the load designated above, and do hereby certify that at that time and on that date the quality and condition of the load as shown by said samples were as stated above.

Inspector

Approval of Certificate Form. Before the certificate forms are ordered from a printer by either the State inspection office or a processor, a draft of the proposed form shall be submitted to the Washington office for approval. This procedure is required in order to avoid embarrassment which can result from printing forms which are unsatisfactory to the Department. (67)

A processor may wish to have the certificate printed at his own expense in order to have his name printed on the line designating the buyer. This is satisfactory, provided the Washington office has an opportunity to inspect and approve a draft of the form before it goes to the printer. (68)

Recording Special Information. Certain contracts governing the purchasing of corn may develop the need for special information on the certificate. Such things as the number or percentage of ears in the sample affected by worms or the number affected by corn borers may be of such concern to the processor that he will want them reported. Such items of additional information may be reported in the space headed "Remarks". If the processor is furnishing the certificates at his own expense, he may add a space or spaces for such items, subject to the customary approval of the Washington office. (69)

Recording General Information. General information identifying the lot covered is recorded in the upper part of the certificate. The grower and processor may supply part or all of this information, but the inspector shall be reasonably sure that the facts are correct before entering them. If in doubt, he should leave the space vacant until he has asked someone for verification. (70)

Items to be entered under the grade portion of the certificate are: weight of ears in the husk used for grade sample, weight of U. S. No. 1 husked ears, weight of U. S. No. 2 husked ears and weight of Cull husked ears. If no ears are found in one or another of the three groups, it must be recorded as zero, in order to show that the group has not been overlooked. The maturity classification should be recorded and also any information necessary to satisfy special features of the contract. Percentages of each group of husked ears shall be entered after being calculated by one of the two methods discussed under "Calculating Percentages" (paragraphs 64 and 65). (71)

Signing Certificates. The signature on the certificate shall be that of the inspector who graded the sample. He must sign his name as it appears on checks and other business papers. It should be written legibly, with the last name complete. Nick names or initials in place of last names do not constitute legal signatures, and must not be used in signing certificates. (72)

- (73) Distribution of Copies. Usually the certificate is issued in triplicate. The first copy goes to the processor or buyer, unless other instructions are issued. The second copy goes to the grower, and the third is kept by the inspector for the Inspection Service file.
- (74) Care of Certificates. A supply of certificates should be furnished by the supervisor for the inspector. Both should see to it that more are obtained as needed before the supply runs out.
- (75) Unused certificates should be kept in a safe place away from dirt, corn juice or anything else which might damage them. Also, they should not be entrusted to the custody of persons not unauthorized to use them. The inspector is responsible for them when they are issued to him, and he should use whatever precautions are necessary to safeguard them. The supply remaining when the inspection station is closed for the season should be accounted for and turned over to the inspection supervisor.
- (76) Certificate copies covering completed inspections shall be carefully filed in numerical order. A covered box or some similar device will serve to keep the copies in order and to protect them from dirt or corn juice. It is customary for the supervisor to pick them up at frequent intervals or to arrange to have them mailed to the inspection office.
- (77) Changing Certificates. Altering or changing the information on a certificate by persons other than members of the Inspection Service is a penal offense. Inspectors should be careful to write each figure accurately and clearly, in order to avoid the need for changes. If a mistake is made in that part of the certificate not dealing with grade, it may be corrected without particular concern. However, a mistake in the portion of the certificate reporting weights and percentages determined in grading the sample is a more serious matter.
- (78) When it is necessary to correct any of the figures reporting weights, percentages or the maturity classification, the inspector must write his initials as close as possible to the change to signify that he is the one who made the correction. If a very large correction or several small corrections are required to make a certificate right, it will be better to void the first certificate and issue a new one.
- (79) Voiding Certificates. Occasionally, a serious mistake or several small mistakes may be made in writing a certificate. In such cases, it is better to issue a new certificate reporting the grade. The word "VOID" shall be written in large letters diagonally across the face of all copies of the incorrect certificate, and they shall be filed in their proper place by serial number with the copies of certificates already issued.

SECOND INSPECTIONS

A second inspection may be requested for one of two basic reasons: 1 - to determine the accuracy of the first inspection; or 2 - to determine the present stage of maturity of "held-over" corn. (80)

Reinspection To Determine Accuracy. When a second inspection is requested, it is usually because someone believes that the grade or maturity determined from the first inspection is not truly representative of the quality of the load. Unless otherwise stated, it may be assumed that the question hinges on whether the sample was representative. In rare instances, the request may be based on the contention that the inspector has not interpreted the grade requirements correctly. In either case, the second inspection should be requested and performed as soon as possible after the first. (81)

Question of Sampling. If the request for a second inspection seems to be based simply upon the question of whether the sample was representative, the inspector should draw another sample, making sure that he obtains ears from many parts of the load. The sample should be carefully graded in the usual manner. If the results of the second inspection are so different from the first as to establish the fact that there had been a mix-up in the identity of the sample, the first inspection should be disregarded and the results of the second inspection should be entered on a new certificate. Otherwise, the results of the first and second inspections shall be averaged, and the average grade reported on the certificate. If a certificate has been written covering the first inspection, all copies should be marked "VOID". Under no circumstances should the original sample be regraded, because the kernels are known to become tough rapidly when exposed to the air. (82)

Question of Grade Interpretation - Appeal. If the request is based on the contention that the inspector has not interpreted the grade standards correctly in sorting the sample, it may require an appeal inspection. The inspector should try to adjust the difficulty by courteously explaining and demonstrating how he has graded the corn. An appeal will be granted only when it is certain that the Federal Supervisor or Key Inspector authorized to make appeals can be present. If circumstances do not permit the making of an appeal inspection, the grower or processor may refer his complaint to the Supervisor by telephone. In that case, the Supervisor or Key Inspector will visit the local inspector as soon as possible, and correct him if necessary. If at any time the inspector is uncertain about the accuracy of his interpretations, he should contact the Supervisor or Key Inspector and request to be checked. (83)

(84) When a Supervisor or Key Inspector makes an appeal inspection, he should do so as promptly as possible, and should analyze a sample of double the usual size. Never average the results of an appeal with those of the first inspection. The results should be shown on a certificate with a statement written across the face of it as follows: "Appeal Inspection. This certificate supersedes certificate No. _____."

(85) Reinspection to Determine Maturity: Sweet corn is sometimes held for considerable lengths of time at the factory before being processed. The processor may request a second inspection to be made just before the corn is used, in order that he may know what the maturity of the corn is at that time. In such cases, the inspector should sample and grade the corn in the usual manner. The inspection certificate should show the hour as well as the date and the grade, and should be marked "second inspection", but need not make any reference to the first inspection.

OBJECTIVE TESTS FOR MATURITY

(86) Several methods of testing have been applied to sweet corn for measuring its relative stage of maturity without entrusting the determination to personal judgement. Each of these tests is considered quite dependable by its proponents, but is not considered satisfactory by others. There apparently is not sufficient agreement among industry members to justify the adoption of any one of the methods as part of the U. S. standards. Tests which have been introduced and tried are as follows:

(87) Moisture Content Tests. The percentage of moisture content of the kernels decreases as the age of the corn increases. This relationship is not uniform with all varieties and all weather conditions, but it is significant. Several methods have been used to determine the moisture content. The most widely used method involves the use of a wet-cell electronic moisture tester made by Steinlite. The moisture is drawn out of mascerated kernels by a liquid called "aquafin" which is then tested in the electronic instrument to determine how much water it has absorbed from the corn.

(88) Refractometer Test. The concentration of soluble solids in the juice of the corn kernels decreases as the corn ages. This is chiefly due to the change from sugar which is soluble in water to starch which is not soluble. The test is based on the principle that light rays passing through a solution are bent or diverted from a straight course - the amount of bending being dependent upon the amount of sugar present. Juice from the corn kernels is placed on a glass surface and looked at through a small microscope which gives a scaled reading of the percent of soluble solids in the juice.

Succulometer. This test indicates the relative maturity of the corn by determining the amount of liquid which can be extracted from a mascerated sample of kernels. It is basically another means of determining the moisture content. (89)

Puncture Tester. The puncture tester, developed by the U. S. Department of Agriculture many years ago, measures the pressure in terms of grams required to force a very small plunger through the pericarps of a kernel of corn. It determines the relative tenderness or toughness of the pericarps one-by-one. This instrument has been used to some extent in the past by the Inspection Services as a means of checking the judgement of inspectors on the thumb nail tests. (90)

Other Tests for Maturity. Other methods or variations of methods for testing to determine maturity have been tried, but none have received as much publicity as those mentioned above. (91)

Application of Maturity Tests. Although the U. S. Standards for Sweet Corn do not include provision for the use of any objective test for maturity, the Inspection Service will grade corn on the basis of one or more of the testing instruments if requested to do so. Tests with some instrument such as a moisture tester, refractometer or succulometer could be made in place of the maturity classification in connection with the grade determination, or could be used as the sole basis of evaluating the corn without reference to the U. S. Standards. (92)

If a processor wishes to purchase corn on some special basis of pricing subject to Federal-State Inspection, the basis for grading must be agreed upon in advance by contract or other written form of agreement. It will probably be necessary for him to supply the instruments and special equipment required to make the kinds of objective tests specified in the contract. When these conditions have been met, it will be satisfactory for the Supervisor to provide the inspection service on the basis requested. (93)

Operation of the instruments mentioned above which are used to determine maturity requires a lot of patience and a reasonable amount of skill, in addition to some special instruction. Careless or too hurried performance of the tests is likely to defeat their purpose. (94)