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Quality Control in the Seed Industry

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Why Emphasis on Seed Quality?

Changes in agronomic practices during the past 10 to 15 years, such as increased mechanization, increased use of agricultural chemicals (particularly herbicides), increased cost of seed, increased labor and production costs have all contributed to the farmer's awareness that the use of high quality seed will assure good stands, reduce the problems in replanting, produce more uniform stands that facilitate mechanization and reduce operation costs. Farmers have become quantity conscious.

Mechanization of seed production has been to the detriment of seed quality. In most instances anything done to mechanize seed production adversely affects the physiological quality of the seed. Monitoring the production system is necessary to minimize these effects.

The development of methods to identify quality problems and to measure seed quality have made it practical to employ quality control systems. Competition among seedsmen to produce better seed has led to emphasizing quality. Measurements of seed quality other than purity and standard germination are being used in sales promotions by some seed companies.

What is Seed Quality?

Seed quality embraces many facets. When quality is viewed in terms of a seed lot, we consider such things as physical purity, i.e. weed seed, inert matter and other crop seed content, moisture content, general appearance and uniformity. Quality in terms of the individual seed involves "genetic" purity, viability, vigor, performance potential, size, infections and infestations.

Some of these factors interact with others. For example, inert matter may mar the general appearance; insect and disease infestations may reduce vigor and viability. General appearance and uniformity may not affect planting quality but may enhance the saleability of the seed lot. Seed of mixed sizes may germinate and produce as well as if the seed were sized but certainly would not be as attractive to the buyer.

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Establishing and Utilizing Quality Control:

Many seedsmen employ some quality control techniques in their businesses. Far too often, however, these techniques are not organized into any system that will allow their use in a critical analysis of the seed production-processing program. A well organized quality control program can be a powerful management tool in any seed organization. Procedures must be critically analyzed to determine where the problems are and the necessary adjustments must be made to eliminate or minimize these problems.

Quality control is essentially a problem-solving process. The problem must be identified, its effect evaluated and its cause determined. Corrective action must be taken, the effectivieness of this action evaluated, and observations continued to prevent reoccurrence.

Quality control begins early in the seed production program. At planting time much can be done to enhance seed quality. Weed control begins at planting. Uniform stands of vigorous plants contribute to uniform maturity which facilitate harvesting, handling and processing. The field aspect of quality control continues through harvest. The evidence of a good or poor weed control program is apparent at harvest time. It is much easier in many instances to keep weeds out of seed than to remove them by processing. Another critical factor at harvest time is field exposure. Seed should be harvested as soon as possible to reduce field exposure time. Results of field exposure on cottonseed germination are presented in Table 1.

Table 1. Germination percentages of cottonseed in relation to the number of days of exposure in the field.

Boll No.	% Germination	Days of Exposure Before Harvesting
1	33.3	82
2	23.0	79
3	32.4	75
4	79.4	73
5	48.2	66
6	56.8	65
7	77.7	63
8	60.9	58
9	73.6	57
10	76.6	55
11	75.2	48
12	81.5	48
13	79.4	45
14	73.5	43
15	80.0	40

Similar effects may be experienced with other crops, such as frost damage in corn and weather damage in soybeans, etc. Field exposure is emphasized because once deterioration begins the process cannot be prevented- only retarded. If deterioration progresses far enough in the field, it will continue at a rapid rate under most storage conditions, and in a relatively short period of time the seed will be of little value for planting.

Quality control is a continuous process. It must furnish insights into all aspects of a seed business. The cleaning and processing procedures should be monitored. Regular checks should be made where problems are likely to occur and these may be different for different kinds of seeds.

Storage is an area often overlooked. Many seedsmen assume that once seeds are stored no further problems will occur until seed are moved. This is not necessarily the case. All seed are not stored in the same condition. Although these differences may be slight, they may become magnified in storage. Weather conditions change; thus storage conditions may change with the weather. A small amount of high moisture seed may have an adverse affect on a much larger quantity of seed at the proper moisture level. Observations of changes in seed quality during storage may be of great value in locating problems, planning changes in storage facilities or planning new facilities.

What are some of the tools that might be employed in a quality control program?

1. Moisture testing: This information is necessary for harvesting, processing, and storage in order to reduce damage and retard deterioration as much as possible.

2. Mechanical damage evaluation: Mechanical damage may occur throughout harvesting and processing. Incident and severity of mechanical damage adversely affects thequality of seed and adversely affects performance. Because of these advers effects, mechanical damage should be held to a minimum.

Table 2. Effects of mechanical damage on the germination of acid delinted cottonseed.

Lot No.	Germination					
	Composite	Uncut	% Increase	Minor Damage	Major Damage	% Damage
1	78.5	88.0	9.5	77.0	34.0	8.5
2	70.5	81.0	10.5	66.0	40.0	10.5
3	82.0	84.0	2.0	76.0	43.0	10.5
4	75.5	85.0	9.5	89.0	50.0	12.5
5	80.5	86.0	5.5	72.0	35.0	16.5
6	76.5	92.0	15.5	70.0	37.0	17.5
7	71.0	80.0	9.0	72.0	16.0	17.5
8	83.5	92.0	8.5	75.0	45.0	18.5
9	67.5	88.0	20.5	57.0	21.0	19.5
10	82.5	89.0	7.5	87.0	37.0	20.5
11	70.0	87.0	17.5	82.0	47.0	24.0
12	79.5	89.5	10.0	68.0	33.0	26.5
AVG.	76.5	86.8	10.3	74.2	36.5	16.9

Table 3. Effects of severity of mechanical damage on the performance of acid delinted cottonseed.

Seed Damage Classification	% Std. Germ.	% Seedling Emergence	
		Sand Test	Cold Test
Uncut	95.1	94.1	70.8
Pin-Hole	93.4	85.8	57.0
Minor	86.4	71.9	43.4
Major	63.0	44.4	28.0

3. Germination testing is basic in any quality control program: Certain lower limits must be surpassed before seed can be considered marketable.

4. Additional quality evaluation techniques: Since it has been repeatedly demonstrated that standard germination tests alone are not adequate measures of seed quality, some other measures of seed quality should be employed in a quality control program. The type of test will vary depending upon your objectives. The cold test is quite widely used for corn and to a lesser extent for several

other crops. The tetrazolium test and other enzyme tests may be applied to a quality control program. Growth rate measurements may also serve a purpose. Accelerated aging may serve to predict storability. It may be necessary to employ a combination of tests to fit a particular need.

5. Purity analysis is routine in the seed testing procedure: This can also be extremely valuable in determining processing procedures.

6. Weight per bushel or other density measurements can be of value in determining seed quality. Generally, as density increases seed quality increases.

These are some of the measurements of quality that might be employed in a quality control program. There are others. Many seedsmen have their "pet" ways of measuring seed quality. These vary with the species in question. Some have proved successful over the years and should be retained as long as they fit the need.

The complexity of organization of a quality control program will vary from one company to another. Costs and personnel required is also dependent on company size and complexity. Details must be tailored to fit particular needs. Standards must be established that fit individual needs and that are workable.

Value of Quality Control:

Most seedsmen look first at the expense involved in initiating or upgrading a quality control program. In many instances existing procedures may require only better organization. Some techniques can be included without additional personnel and at little increase in cost.

Quality losses are avoidable with little or no additional costs. Proper equipment adjustment or changes in processing technique provide basic means of upgrading quality. Others may be avoided with small expenditures such as equipment modification, adding accessory parts to equipment, using pallets in warehouses or changing bag types. Still other quality losses may be avoided only where costs exceed returns.

Small losses over extended periods of time may result in large losses of dollars when considered as a whole. These are some of the things that a well organized quality control program will reveal to a keen manager that are often overlooked. Quality

control should be applied to the overall operation; otherwise, its value is severely limited.

What can be expected from a quality control program?

1. A Better product.

2. Greater profits by reducing losses.

3. Satisfied customers.

4. Repeat customers.

A quality control program is a management decision. As you begin the 1970's, ask yourself: without an effective quality control program, where will I begin the 1980's?