

Mississippi State University

Scholars Junction

Proceedings of the Short Course for Seedsmen

MAFES (Mississippi Agricultural and Forestry
Experiment Station)

4-1-1976

Keys to Successful Seed Operations

D. M. Tekrony

Follow this and additional works at: <https://scholarsjunction.msstate.edu/seedsmen-short-course>

Recommended Citation

Tekrony, D. M., "Keys to Successful Seed Operations" (1976). *Proceedings of the Short Course for Seedsmen*. 310.

<https://scholarsjunction.msstate.edu/seedsmen-short-course/310>

This Article is brought to you for free and open access by the MAFES (Mississippi Agricultural and Forestry Experiment Station) at Scholars Junction. It has been accepted for inclusion in Proceedings of the Short Course for Seedsmen by an authorized administrator of Scholars Junction. For more information, please contact scholcomm@msstate.libanswers.com.

KEYS TO SUCCESSFUL SEED OPERATIONS

Dennis M. TeKrony^{1/}

The primary key to seed quality is the ability of a seed to emerge from the soil, develop to self-sufficiency, and reproduce itself. If this sequence of events occurred for all seed planted, seedsmen as well as farmers would have few problems associated with seed quality. Because this sequence of events does not always occur we must be concerned with seed quality.

In this paper the following topics are discussed:

1. What is seed quality?
2. Improving physiological seed quality through new knowledge.
3. Examining your philosophy toward seed quality.

It is believed that seedsmen who understand these three "Keys to Seed Quality" will have a good start toward successful seed operations.

WHAT IS SEED QUALITY?

It is one thing to understand seed quality, but quite another to be able to explain it to a farmer or potential customer. The following are commonly accepted factors of seed quality: (1) genetic purity, (2) mechanical purity, (3) physiological quality, (4) physical and specific quality and (5) crop performance. A definition of seed quality can be derived from a composite of all these factors. Each factor is an important single trait of seed quality which you must be able to define and explain when selling your seed and seed program.

Genetic Purity

Genetic or varietal purity is essentially the pedigree of a crop variety. When a farmer buys certified seed, the "blue tag" provides written proof of genetic purity similar to the registration papers for a purebred Angus bull. Seed growers and seedsmen know that genetic purity also means that the crop variety is true-to-type as developed by the originating plant breeder. When seed is increased through the seed certification system, the variety's yield potential, disease resistance, lodging resistance or any other characteristic present at the time of release have been maintained for the farmer who buys genetically-pure, certified seed. As seedsmen you must inform farmers that each certified seed lot has been checked in the field and the seed laboratory. These checks include: (1) positive identification of the seed source planted, (2) adequate isolation to prevent cross-pollination and mixing, (3) knowledge of previous cropping history, and (4) specific counts for off-

^{1/} Extension Seed Specialist, Kentucky Agri. Ext. Service, University of Kentucky, Lexington, Kentucky.

type plants in the field and seed in the laboratory, when applicable.

The final check for genetic purity is the field performance of certified seed for all crops on the farms in your area. This performance is not always easy to see but it is there primarily because genetically-pure, certified seed are a "step above" uncertified or bin-run seed in genetic quality. We must convince farmers that the major asset of certified seed is genetic purity and that high mechanical purity and germination are merely bonuses of such seed.

Mechanical Purity

Seedsmen have probably spent more time and money during the past several decades trying to improve the mechanical purity of seed lots than any other factor of seed quality. The commonly accepted factors for seed which are high in mechanical purity are:

1. High percentages of pure seed of the crop being sold.
2. Low percentages of contaminants such as weed seed, other crop seed and inert material.
3. Freedom from noxious weeds.

Mechanical purity is extremely important to the farmer-customer because it represents either the purity of the seed or the contaminants in the seed lot. State and federal seed laws require truthful labeling of seed prior to sale in the United States. The seed tag provides a ready reference for an alert customer regarding the mechanical purity of a seed lot.

Most important for seedsmen, however, is the fact that when the farmer opens the bag or after he plants the seed he can see the contaminants either in the seed or in the field. These crop contaminants reduce yields and lose customers, therefore, it remains important that mechanical purity receive much of a seedsman's attention. Farmers should know how much of your time is spent on cleaning up fields and seed lots each year.

Physiological Factors

I am not convinced that seedsmen completely understand the physiological aspects of seed quality. The term physiological is simply defined as "the functions and activities of a living seed." This includes many factors in addition to the seed's germination potential, but starts when the seed is first alive and continues until its death. Physiological maturity occurs at that point when the seed reaches its maximum dry weight. Maximum viability and vigor of the seed are reached at this same point. Unfortunately, the moisture content of most seeds at physiological maturity ranges from 30 to 50% which does not permit mechanical harvest. This means that harvest maturity, the time when seed can be mechanically threshed, occurs sometime later allowing time for deterioration to start and eventually leading to the loss of

vigor, longevity and viability.

There is some confusion among seedsmen regarding the terms: viability, germination and vigor, as they relate to seed quality. A seed is viable at any point after life begins until it dies. However, the Association of Official Seed Analysts defines germination as, "the emergence and development from the seed embryo of those structures which for the kind of seed in question are indicative of the ability to produce a normal plant under favorable conditions." This definition means much more than viability alone. A germinable seed is not only alive, but will emerge and develop, forming its essential structures, into a normal plant when planted under favorable or near ideal conditions.

There have been many definitions and tests for seed and seedling vigor in recent years. Woodstock's^{2/} definition of seed vigor states that, "Seed vigor is that condition of active good health and natural robustness in seed which, upon planting, permits germination to proceed rapidly and to completion under a wide range of environmental conditions." When compared to the previous definition we can observe that seed which are vigorous will not only develop but develop rapidly, and that the seedling developing from vigorous seed will emerge under a wide range of conditions. Thus, germination only relates to field emergence when planted under favorable field conditions, whereas a vigorous seedling should emerge under less than ideal field conditions. Many seedsmen and farmers have confused the meaning of germination test results as related to field emergence for many years and have thought that the germination percentage indicated field emergence regardless of field conditions.

Many tests for seed vigor are available today, ranging from practical to complex. There is much discussion as to which seed test to use and the best application of vigor test results. I believe that seed growers and seedsmen should utilize vigor tests as a means of selecting and determining the quality of seed lots in their quality control programs. However, due to the present state of confusion, I do not believe vigor information should be presented on analysis tags for a farmer's use. The next time you have the opportunity, explain the various aspects of physiological seed quality to a potential customer or your employees.

Physical and Specific Factors

The commonly accepted physical factors of seed quality include: seed size, uniformity and the appearance of a seed lot. Any type of seed damage regardless of its origin, insect, mechanical, or diseases, lowers the physical quality of a seed lot. Even though physical factors of seed quality may not be as important as genetic purity or physiological quality it is important to you as seedsmen since the customer can

^{2/} Woodstock, L.W. 1973. Physiological and Biochemical Tests for Seed Vigor. Seed Science and Technology 1:127-157.

see this aspect of seed quality at the time of purchase or planting. The other factors of seed quality may be of little consequence if the seed lot's appearance is so poor that the customer will not buy it.

Depending on the crop involved, the specific factors of quality may or may not have a bearing on the overall quality of a seed lot. These specific factors may include oil, protein, or starch content and sometimes milling quality of the seed. Only you know if these are important in your seed operation.

Crop Performance

Seed must perform in the field to be high quality, since the farmer depends on performance and yield in his farming operation. Therefore, I have included performance as one of the factors of seed quality. There is little doubt that if farmers do not obtain a satisfactory stand in the field, yields will be reduced and the performance lowered. Contaminants which lower the genetic purity, crop purity, or increase disease infection can cause crop and yield losses. Likewise there has been recent research that implies that high vigor seed will give greater performance in the field than low vigor seed of the same kind and variety. It is important that you advise farmers of yield losses that can occur by not using the highest quality seed possible in their farming operations. It is important that you explain and educate your customers about the keys to seed quality and how you maintain high quality seed in your seed production and processing operations.

IMPROVING PHYSIOLOGICAL SEED QUALITY THROUGH NEW KNOWLEDGE

Successful seedsmen have found that many of the seed quality factors outlined above can be controlled by using a rigid quality control program. Such a program is supplemented by quality conscious seed growers, processors, and seed certifying agencies. One factor, physiological quality, is difficult to control and even more difficult to maintain from production until planting. Thus, many seed growers and seedsmen who produce soybeans, peanuts, cotton, sorghum, and similar seed crops are constantly frustrated due to the uncertainty of the physiological seed quality. The greatest frustration of all is no matter how hard a seed grower or seedsman may try during production and storage, the physiological seed quality, whether measured by germination, vigor or viability, may be lost before the seed are sold and planted.

There are two stages in the life of a seed that influence physiological quality. They are: (1) seed development and maturation, and (2) seed storage either on the plant or after harvest. Both of these stages have a bearing on the eventual seed viability, vigor, and longevity and are strongly influenced by an uncontrollable element, the environment. The situation is further complicated during seed production by the fact that the environment interacts with at least two other factors, cultural methods during production and the genetic characteristics of the variety being produced.

Since I believe that all seed quality is made or lost in the field, I will present some examples of how the environment interacts with many other factors to lower physiological quality. Since I work most with soybeans, I use soybean seed in all of these examples, however the same principles may apply to many other seed crops as well.

Planting date and stand establishment

Most farmers and seed growers assume that if they plant seed crops properly an adequate field stand will result and they will get maximum yields. Unfortunately, there has not been enough emphasis on producing high quality seed as well as maximum yields. The effect of planting time and procedures is not usually thought to be related to seed quality. Seed growers presently apply many herbicides, insecticides and fungicides during seed production with no knowledge of what influence these pesticides have on seed quality. In recent years some herbicides have been found to strongly interact with seedling emergence of some soybean varieties when applied at recommended rates. I predict that scientists will closely examine not only the influence of these pesticides on stand establishment but on the resulting quality of the seed crop produced in future years. The results may lead to adjusting rates to improve seed quality.

Most seed growers plant when field conditions are ideal for stand establishment. Green *et al*^{3/} reported that the date of planting soybeans can affect the quality of the soybean seed produced. They compared early, medium and late maturing varieties planted at several dates ranging from April to July at Columbia, Missouri for three years. The results indicated that soybean plants from early dates of planting which matured during hot, dry weather produced seed of lower quality. Seed from later dates of planting, which reached maturity after hot, dry weather had ended, generally exhibited higher quality. This tends to explain why soybean seed producers in all soybean growing regions commonly have more seed quality problems with early and medium maturing varieties than with later full season varieties.

Seed growers know that other environmental factors such as rainfall, relative humidity, and disease infection throughout development and maturity may also influence the quality. Regardless of the cause, seed growers must consider the effects of planting date on seed quality. It may be necessary in the future to produce soybeans, peanuts or cotton out of their region of use to be assured of high quality seed. This has already been done successfully with many other crops such as hybrid corn, vegetables and smallseeded grasses and legumes.

Harvest Date and Equipment

Unfortunately, the time of harvest has not received adequate atten-

^{3/}Green, D.E., E.L. Pinnell, L.E. Cavanaugh and L.F. Williams. 1965. Effect of Planting Date and Maturity Date on Soybean Seed Quality. Agronomy J. 57:165-168

tion from seedsmen. Many seed growers and farmers have often completed many other farming operations prior to harvesting their seed crops, which results in a low quality seed. Recent research by A.D. Phillips^{4/} at the University of Kentucky indicates the importance of time of harvest on soybean seed germination and vigor. He found that the highest seed quality for two varieties, 'Cutler 71' and 'Kent', occurred at physiological maturity and remained at a high level until harvest maturity (first time the seed dried to 14% moisture content). However, the vigor of the seed dropped very rapidly within 7 to 30 days after harvest maturity. This may explain why certain seed lots which have a high germination in the fall suddenly lose germinability and quality in the spring prior to planting. It also points out the importance of using vigor tests as a means of selecting seed lots following harvest.

A recent report by Wilcox et al.^{5/} in Indiana supports Phillips' work and shows that soybeans of several varieties harvested late, when compared to normal harvest, had much lower field emergence. They also reported that this late harvested seed had a high occurrence of pod and stem blight which reduced seed quality. It is interesting to note, however, that the research in Kentucky did not show a close correlation between diseases and seed vigor. Thus, the influence of the environment on seed quality is extremely complex and will not be solved by one research study, but will require extensive investigations. The major point of the above reports is that soybeans or any other seed should be harvested the first time they dry sufficiently for threshing.

Many reports have been presented through the years on the importance of combine adjustments and seed moisture content during harvest on seed quality. As seedsmen you recognize that the man operating the combine can "make or break" your seed crop regardless of the variety or crop involved. If we ever get serious about seed quality we will eliminate the equipment that was developed for grain use and use equipment that was developed for high quality seed. I challenge you seedsmen to seriously consider a combine, conveyor, seed cleaner or any other piece of equipment that will maintain seed quality.

We have many unanswered questions regarding the effects of crop varieties, environment and cultural practices on seed quality. However, we have made progress in recent years toward solving this complex puzzle. I predict that through new knowledge in future years you will be able to improve and possibly control physiological seed quality using new methods of seed production, handling and storage. To do this we are going to have to look past the seed or seedling and look inside the seed and plant cells. I challenge all seedsmen to use the knowledge pre-

^{4/} Phillips, A.D. 1975. Effect of the Pre- and Post-Harvest Environments on Soybean Seed Maturation and Quality. M.S. Thesis. University of Kentucky.

^{5/} Wilcox, J.R., F.A. Laviolette and K.L. Atlow. 1974. Deterioration of Soybean Seed Quality Associated with Delayed Harvest. Plant Disease Reporter 58(2) :130-133.

sently available to improve your operations. Secondly, you should encourage and support new research designed to more closely examine the mysteries of the seed.

EXAMINING YOUR PHILOSOPHY TOWARD SEED QUALITY

Each year for the past twenty-four years someone from a seed company or university has explained, defined or cussed seed quality at this Short Course. Many seedsmen attend this or other meetings annually and hear of quality control programs directed toward producing and maintaining high seed quality. I maintain that all this explanation is mere trivia, unless you as seedsmen have the proper philosophy - year around - toward seed quality. What is your philosophy? Do you talk a good program, but then go home and do exactly what you've been doing for the past 10, 20, or 30 years? There are several areas that concern me about the philosophy of seedsmen and others associated with the seed industry.

High Quality Seed is the Only Saleable Product

To operate a "successful" seed business today, I believe you have to develop the philosophy that high quality seed is your only saleable product. A good start toward such a philosophy is having and believing in a workable quality control program for the seed crops that you produce. Such a quality control program starts at planting time and continues, year around, throughout harvest, processing, storage and eventual sales. Quality control means checks and more checks for genetic and mechanical purity as well as physiological quality. If run properly such a program will help you improve seed quality and advise you on which seed lots to discard and not sell. The true test of this program comes when the customer plants your seed and is satisfied with the field performance.

How would you answer this "loaded" question? When the demand for seed is high and "your" seed quality is low which do you sacrifice, dollars or quality? This can be a tough decision for you and your seed company. I recognize that you have to sell seed and make some profit to stay in business. I also know that the customer that you have convinced regarding your high seed quality may be lost if you sell him inferior quality. You alone are the only person that can make this decision for your seed business. I sincerely hope that seed quality is not always sacrificed when it is in competition with seed sales. I believe that the farmers of the future in U.S. agriculture are going to insist on high seed quality. The seedsmen that can consistently supply this seed will remain successful.

Producing Seed, Not Grain

In many areas of the United States the farmers that produce seed of various crops are primarily grain production oriented. The seed crops that are produced on contract for a seed company or seedsmen are a small part of the total farming operation, which means that seed quality is sacrificed while other farm crops are being produced. Secondly, even

sently available to improve your operations. Secondly, you should encourage and support new research designed to more closely examine the mysteries of the seed.

EXAMINING YOUR PHILOSOPHY TOWARD SEED QUALITY

Each year for the past twenty-four years someone from a seed company or university has explained, defined or cursed seed quality at this Short Course. Many seedsmen attend this or other meetings annually and hear of quality control programs directed toward producing and maintaining high seed quality. I maintain that all this explanation is mere trivia, unless you as seedsmen have the proper philosophy - year around - toward seed quality. What is your philosophy? Do you talk a good program, but then go home and do exactly what you've been doing for the past 10, 20, or 30 years? There are several areas that concern me about the philosophy of seedsmen and others associated with the seed industry.

High Quality Seed is the Only Saleable Product

To operate a "successful" seed business today, I believe you have to develop the philosophy that high quality seed is your only saleable product. A good start toward such a philosophy is having and believing in a workable quality control program for the seed crops that you produce. Such a quality control program starts at planting time and continues, year around, throughout harvest, processing, storage and eventual sales. Quality control means checks and more checks for genetic and mechanical purity as well as physiological quality. If run properly such a program will help you improve seed quality and advise you on which seed lots to discard and not sell. The true test of this program comes when the customer plants your seed and is satisfied with the field performance.

How would you answer this "loaded" question? When the demand for seed is high and "your" seed quality is low which do you sacrifice, dollars or quality? This can be a tough decision for you and your seed company. I recognize that you have to sell seed and make some profit to stay in business. I also know that the customer that you have convinced regarding your high seed quality may be lost if you sell him inferior quality. You alone are the only person that can make this decision for your seed business. I sincerely hope that seed quality is not always sacrificed when it is in competition with seed sales. I believe that the farmers of the future in U.S. agriculture are going to insist on high seed quality. The seedsmen that can consistently supply this seed will remain successful.

Producing Seed, Not Grain

In many areas of the United States the farmers that produce seed of various crops are primarily grain production oriented. The seed crops that are produced on contract for a seed company or seedsmen are a small part of the total farming operation, which means that seed quality is sacrificed while other farm crops are being produced. Secondly, even

the conscientious farmer may have problems producing seed because nearly all of his expertise and equipment is related to successful grain production. The major point to be emphasized is, there is a big difference between producing seed and grain. I recognize this problem probably relates mostly to farmers producing seed of soybeans, small grains, cotton, rice and peanuts. However, I believe it also relates to specialty seed production areas such as the Willamette Valley in Oregon where commercial wheat production and hay production are handled by the same farmer that produces grass seed.

Recognizing that seedsmen will continue to use farmers as contract growers, how can you convince the farmer to take special care with your seed crop to improve quality? Is it simply a matter of economics? I doubt it; however, I would challenge seedsmen to consider paying a premium for high quality seed. Such seed should not only meet state certification standards for genetic purity and quality, but must also meet your standards for high quality before the premium is paid. These additional standards may relate to higher germination, purity, vigor, low mechanical damage or other factors important to quality. Some seedsmen are doing this successfully now, why not give it a try.

Even though additional premiums may improve quality, I believe the most important factor in working with contract growers is communication. As seedsmen you must let the farmer-contract grower know what seed quality you expect and how to get it. Advise him personally on cleaning his equipment, adjusting the combine, when to plant and harvest seed and how to store it. Visit your contract growers and their seed fields regularly. Look at the seed fields and inspect them yourself prior to harvest. Seedsmen who work closely with their contract growers find what they can and cannot do and usually have higher quality seed. The seedsmen that commonly complain the most about contract growers only see them twice a year, when they pick up their foundation or registered seed at planting and when they deliver seed at harvest. This is not enough. Communication is mandatory to consistently produce high quality seed of any crop. Let's work together to improve the philosophy of the seed grower toward seed quality.

Selling the Importance of Seed and Seed Quality to Agriculture and Your Neighbor

I believe every seedsman, seed grower, processor, retailer and university professor must make a real effort to move seed and seed quality to the number one priority. To do this we must tell the same story while we are selling seed. We must convince farmers that High Quality Seed:

1. Is an essential part of profitable farm production. He must know that regardless of how much he spends on all inputs of crop production, they could be lost unless he gets an adequate stand of the right variety in each field.

2. Is a small part of the total farming investment. Farmers must recognize that the 2 to 5 cents of every production dollar spent on seed is a small investment considering the potential returns.
3. Means long term returns to farming operations. Take the time to advise farmers on how much income they can lose per acre from troublesome weeds, or unwanted crop contaminants in their fields. A loss of one bushel or a few pounds per acre may not seem like much, yet it will more than pay the difference asked by reputable seedsmen for high quality (certified) seed.
4. Supports all life. How often does your urban neighbor or friend bring up the food crisis or the high cost of food at the super market? We in the seed industry must give this neighbor some friendly advice on where seed and plants fit in the total world food picture. Not only are many seeds consumed directly for food, but seed either directly or indirectly supports all human life. Sometimes we are not vocal enough about our valuable product-the seed. Let's educate the world on its importance.

The seed business is highly competitive now and will be more competitive in future years. This is a good trend provided everyone involved maintains the "Keys to Seed Quality" as well as the keys to the bank. Seed quality and seed sales must go together. At the point where farmers are demanding and willing to pay for higher quality seed, I predict that those seed growers and seedsmen who can provide them will remain "successful."