Changing Patterns in the Seed Industry

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My assigned topic presents an enormous challenge and at the same time makes me feel humble in attempting to justly cover such a broad assignment.

Perhaps I should define the term, "seed industry." For purposes of this talk, I am thinking of the seed industry in its entirety to include all segments from the plant breeder to the consumer. For a better term, I will refer to this total industry as involved in the "seed chain". Who makes up the "seed chain"? Actually, all those involved in varietal development, seed growing and processing, selling and buying seed. In other words, the plant breeder, seed stocks organizations, seed growers, wholesale-retail seedsmen, the farmer and lastly, the consumer.

Now, let's take a look at some of the changes that have come about in this "seed chain" since the Seed Technology Laboratory here at Mississippi State University was established in 1950. Certainly after 20 years many changes have taken place all around us. In fact, change seems to be in vogue and certainly, I believe, we will all agree that unless we do change, we are rapidly left by the wayside. This is very true for the United States' total seed industry.

I have heard some of the leaders of our agricultural industry say that more important developments have taken place in agriculture in the past 20 to 30 years than had happened in all the history of its existence prior to that time. This certainly is true of the seed industry.

Consumer

Perhaps a good place to start in analyzing the "seed chain" would be with the consumer - people like you and me - who depend upon agricultural products for the food and fiber we use every day.

Research and application of technology to agriculture have, in recent years, given us the potential to emerge from a long epoch in which most of our energies were utilized to produce food. Instead of the man on the land producing just enough food and fiber to provide a subsistence living for himself and his immediate family, in the United States he supplies these needs for an ever increasing number of people. So that now the percentage of people required to produce our food and fiber needs is less than 5%. This means that 95% of our population is free to work in non-farm occupations.

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An increasing awareness exists today regarding the need to expand food production to meet current and anticipated increases in population. A part of this future need for greater food supplies can be met by utilizing more fully, the existing potential for crop production. Although this may be uniquely true in this country, for the world as a whole, the present land resources at today's levels of food production may not be adequate to meet anticipated needs.

Farmer

This then leads me to the next link in the "seed chain" - the farmer. Previous experience has clearly shown that the most effective way to expand crop production is through the development of improved crop varieties. Genotypes capable of matching the needs for higher production characteristic of today's farming operations are surely different from those acceptable 20 years ago. Production goals, for example, are much higher, necessitated by increased production costs. Farmers have proven their efficiency. Output per man in agriculture has increased some 300% over the last 20 years. Compare that with other industry which has shown about a 50% increase in production per man during a similar period.

As for the farmer in the "seed chain" - he has certainly changed. Twenty years ago he usually saved his own seed or went to his neighbor for his needs. Oh, perhaps he picked up seed of a new variety from the seedsman, but purchasing seed regularly was felt unnecessary. Needless to say seed quality was not a major concern.

The time is past when farmers can plant seed and get by with one-fourth of them germinating and growing. Such plantings do not fit the highly mechanized farming of today. As machines take over and farming operations get larger, growers must use precision planting to sow to a stand for a set number of plants per acre.

Today, of course, farmers are demanding good quality seed and are buying it from seedsmen. Regulatory officials have been extremely practical in their concern for fairness to seedsmen and necessary disclosure of pertinent information to the buyer. As such, the seed control officials are an important link in the "seed chain".

Agricultural production will continue to grow. The average United States farm size in 1971 is estimated at 389 acres, up slightly from last year and substantially above the 306 acre average for just 10 years ago. I think the family farm will be maintained, however. To be sure we will see a lot of farms that will be incorporated.
But these corporate giants will not take over farming as some fear. I see more "commercial farms" operated under good management — men with advanced technical information — not only being familiar with the latest production skills but having a knowledge of cost accounting, enterprise analysis, budgeting, marketing, etc. Such a farmer will demand quality when purchasing products such as seed; he will want technical assistance in using products and above all, he will want to talk to people who know what they are talking about: These are the people who will be buying and planting most of our seed products.

Yes, we will have changes in farming — it will become more industrialized with larger sized farming units involved in production and marketing of agricultural commodities. This is inevitable and the seed industry must adjust to it.

Wholesale - Retail Seedsmen

Then what is the role of the wholesale and retail seedsman in the "seed chain"? Needless to say, it is an important one and one that has also been subjected to change.

The seedsman will no longer be able to set up his business, stock it with merchandise and then sit back and wait for the farmer to come in and buy it. Oh yes, we will continue to have family owned businesses at the grass roots level of distribution. Perhaps change at this level will not be as great as we will see in production and research. I think that many of us have seen the large corporations try the distribution of seed at the local level and in many cases have given up.

But seedsmen have changed over the years — from a strictly selling of merchandise, which is still the number one business, to include a selling of service. Certainly the merchandise has changed — demand for high quality seed has increased, larger volumes of seed are being purchased through normal seed channels. But it is in the service area that great changes have come about. The farmer now expects his supplier to not only be prepared to sell but to service. A farm supply dealer's failure can be predicted if he is unable or unwilling to become involved in keeping up-to-date in the ever increasing technological advances in production.

Someone paraphrased one of the laws of thermodynamics to simply state, "you can't push on something that's going faster than you are." With the rapid growth in size and technical needs of many farmers, this same law can apply to anyone in agri-business who wants to sell and service customers in the farming industry today. You must keep up!
What about the future for seedsmen - the merchandisers? Certainly the small seed businesses will continue to carry on - especially at the distribution level. Big companies may supply these small businesses and will depend upon them heavily as an outlet for their products (seed). The seller of seed will have to major in quality. This will be one of the most important demands of today's and tomorrow's modern farmer. Seed dealers will have to supply seed to grow crops with built-in specifications to be used for a specific purpose.

Knowledge is important. Remember that our commercial farmers are interested in talking to people who know what they are talking about - so the seedsman of the future will be very knowledgeable about the products he sells. The seedsman will have to keep up with the farm problems in his area. He should remember that farmers are disappearing at a fast rate meaning that the total seed market is being concentrated into a smaller group; and, more importantly, it means that there are more people working on each individual farming customer to get his business. This means that many seedsmen will have to change their approach to selling and use a coordinated marketing program which must include service. These fewer customers will expect service from the dealer who sells them seed. Remember, any product, including seed, is worth more to the customer if we help him get more out of it.

If there is a crisis today in the retail farm supply business it lies in the unwillingness to change from yesterday - the opportunity does exist in meeting the challenge of a changing farming industry. So as someone once said, "sell a good product, work like the devil and don't try to kid anybody."

Varietal Development

Varietal development or plant breeding on an applied basis plays an important role in the total seed industry and the "seed chain". There can be little question concerning the important role of plant breeding in the years ahead, just as there has been in the past.

Great strides have been made in plant breeding and development. We have seen the knack of putting new producing capabilities into various crops so that they have greater drought resistance; greater ability to respond to fertilizer; more resistance to insects and diseases; more uniformity in plant growth and resulting crop; more uniformity in quality of the crop as well as improved quality and many other things that are too numerous to mention. It is these improvements that have assisted the farmer in keeping up with the cost-price squeeze as well as providing the consumer with the agricultural products demanded and in the quantities needed. For example, the Delta Branch Experiment Station here in Mississippi recently evaluated 13 obsolete cotton varieties and three current commercial varieties.
After two years of testing, it was determined that the current varieties had a yield advantage (about 100 lbs/a.) and the fiber properties were better than most of the older varieties.

The history of organized plant breeding in this country has provided important guidelines for the future. In the earlier years, and to a lesser extent today, Experiment Station funds were clearly directed at support of plant breeding at public institutions. This was essential. Certainly the farmer could not develop improved varieties and private research in plant breeding was relatively unknown.

The emergence of private enterprise in varietal development created new opportunities for extending the total investment in research. And, of course, created new problems centered around the roles that Experiment Stations might adopt to most effectively use its total facilities in serving the agricultural economy. The need for re-evaluation was realized as more resources were invested by the commercial companies interested in research. Shifts were made and are continuing to be accomplished.

There can be little question but that the trends which have so clearly emerged in the last 20 years or so probably will continue to move forward at an accelerated rate. Food needs become more pressing and opportunities to utilize new technologies in plant breeding give increased incentives for private investments in research.

The State Experiment Stations and USDA have traditionally taken the leadership in research to develop varieties of field crops. As the development of varieties in a specific crop become of such scope to justify the involvement, gradually such has been taken over by private enterprise. The public agencies then generally adjusted their role and responsibility to deal with plant breeding research on methodologies, breeding behavior in greater depth, etc. Along with these changes in programs, the Agriculture Colleges continued to provide the academic training base for those who would pursue this particular scientific field as private breeders. A good illustration of this gradual transition, of course, is illustrated by what has taken place in the area of hybrid corn and sorghum.

As for the future role of plant breeding - this is easy to prophesy. It will be very important to have a strong complimentary public and private plant breeding research program if the seed industry is to survive. In spite of the knowledge already accumulated, there is still a vast unknown field to explore relative to an understanding of the breeding behavior of most crops. It will take the team effort of the public plant breeders working in their research laboratories to better understand the breeding behavior along with the effort of the private breeders.
who will synthesize and multiply new products to better meet the demand of future agricultural needs. Thus public plant breeders will still be needed.

No doubt the public research will be more oriented toward development of germ plasm. Plant breeders, for example, will increasingly need to consider genetic factors for high germination and vigor in their developmental work. Basic research will need to be increased in seed physiology which will help determine how to easily and consistently identify high vigor and then preserve it. Breakthroughs like male sterility in soybeans recently announced in North Carolina, the development of new crops like Triticale are just examples of things to come. And the need for varietal development research by public agencies will vary with the crop involved - depending upon the ability of commercial research to meet the varietal demands of the agricultural industry.

Certainly the public agencies will continue to make their greatest impact on plant breeding through the education and training they give prospective plant breeders.

For the future then, I see public research shifting more toward basic research and the larger companies gradually taking over much of the varietal development work. The rapidity with which this comes about will depend upon the economic demand for improved varieties within a particular crop.

Seed Growers

The role of the seed grower cannot be over emphasized. Obviously the seed grower is an important link in the "seed chain". Many changes have come about in this area of the seed industry.

Some years ago the seed grower basically consisted of a farmer who saved some of his crop and turned it into seed by passing it through some type of fan mill or seed cleaner. It would be this "seed" that he not only planted his crop with but also supplied his neighbors. This expanded and was more "modernized" as seed certification came into being providing a service by supervising this farmer-turned-seed grower and helping him produce seed of known quality.

As you know, the basic concept of seed certification is a system whereby the proper stock seed is identified and used; the increase is carried on through a limited number of generations; every effort is made to keep contaminants to a minimum; special concern is given to harvesting and processing and subsequently the production meeting minimum standards is labeled by the seed certifying agency. Thus, seed certification has become a technology by which qualified and knowledgeable
seed production experts protect the investment of many thousands of dollars in development of a variety. The variety is of no value to commerce until seed of it has been produced through a combination of services rendered by professionals, followed by an education of producers and users of the benefit derived from using genetically pure seed.

What about the future role of the seed grower in the "seed chain". He will continue to be an important link. Perhaps his production will be slightly reoriented. There will, however, continue to be several options available to the grower, some of which will be contract production for a larger seed company, operating as an associate grower, growing seed under a royalty arrangement or perhaps larger growers joining together and developing a cooperative breeding program in turn growing and merchandising their own varieties.

Seed Certification

The role of seed certification to the "seed chain" is an important one. To keep up, however, it has been necessary that changes be made just as changes have come about in all of the seed industry. In other words, seed certification had to be modernized. Leadership in this was through the Association of Official Seed Certifying Agencies (AOSCA). As the name implies, the Association of Official Seed Certifying Agencies is an organization of certifying agencies. The Association was organized in 1919 and is currently composed of 45 member agencies whose members are responsible for seed certification in their respective areas.

The primary purpose of AOSCA is to establish minimum seed certification standards for the production of certified seed. Suffice it to say now that AOSCA works closely with all interested segments of the seed trade, agricultural research and extension, and seed regulatory agencies.

Although its principle purpose is to establish and maintain minimum certification standards, the Association encourages uniform adoption and application of these standards by member agencies. This had to be done on a volunteer basis, and needless to say, some agencies did not comply with these minimum requirements. The result over the years was a lack of uniformity among states in the production and marketing requirements for certified seed. And under the then existing State and Federal laws, nothing could be done to correct this situation. For example, the Federal Seed Act defined a "seed certifying agency" as meaning "an agency authorized under the laws of a State, Territory or Possession, to officially certify seed ....". Further the Act required that certified
seed moving interstate need only to conform to the standards set forth by the agency doing the certifying. That is, certified seed had to meet the requirements of the individual state agency and this could be any criteria for certification which they wished to establish.

Various state certifying agencies required that different procedures be followed and different standards be met before seed could be certified and sold. As you can imagine, this resulted in much difficulty for seedsmen producing and handling certified seed across state lines. Consider for a moment a single seedsman producing and merchandising certified seed in two or more states each having a different set of requirements. Under these conditions the same seed produced, processed and labeled in one state may not have been eligible for certification in the adjoining state. You can surmise the difficulties that could and did arise.

Think with me for a moment from the viewpoint of the user of Certified Seed. His problem was similar. Certified seed produced in one state may not have met the same high genetic purity and quality standards as certified seed from another. This presented no particular problem for the certified seed producer as the seed he grew would be recognized as certified in any state as long as it was labeled by an officially recognized certifying agency. However, our major concern had to be with the consumer who buys the certified seed grown in several states only to find major differences in the seed quality. This then put a burden on the farmer to decide among the various states' certified seed which met the standards of genetic purity which he wished to plant.

The concern was, therefore, manyfold. It was with purchasing, public relations and, in fact, the image of certified seed. Something had to be done that would result in more uniformity with certified seed. Seedsmen were asking that we make it possible for them to produce and merchandise certified seed more easily among different states. Customers were demanding that seed labeled with the Blue Tag meet certain specified approved standards regardless of the state of origin. We could not expect the farmer, or the seedsman for that matter, to be familiar with the different standards of genetic purity required by each certifying agency.

The AOSCA, confronted with these problems, knew that something had to be done but change comes slow as all of you know. They realized that the seed industry, as well as agriculture in general, was changing. Seed certification was becoming big business and "commercial" farmers were demanding top quality seed.
In 1967 the AOSCA Board of Directors authorized its Executive Committee to initiate a study with the view of re-organizing seed certification at the national level. I had the privilege of serving as Chairman of a Study Committee and after many meetings and long debates, it was recommended that (1) we proceed toward obtaining legal recognition for seed certification through an amendment to the Federal Seed Act and Regulations, (2) the name of the organization be changed to the Association of Official Seed Certifying Agencies (formerly International Crop Improvement Association) and (3) the by-laws as well as seed certification standards be reviewed and revised where necessary. I am pleased to say that these recommendations were accepted.

The basic purpose for proposing an Amendment to the Federal Seed Act was to provide for complete uniformity among states in regards to the minimum genetic purity standards for the certification of seed. To do this we asked that "seed certifying agency" and "certified seed" be re-defined under the Act.

The proposed legislature therefore, would (1) give a more definite meaning to the term, "Certified Seed" and (2) authorize the U.S. Secretary of Agriculture to approve standards and procedures for seed certification. The amendment to the Federal Seed Act, in part, is as follows: "The term, 'seed certifying agency' means (A) an agency authorized under the laws of a State, Territory or Possession, to officially certify seed and which has standards and procedures approved by the Secretary (after due notice, hearings, and full consideration of the views of farmer users of certified seed and other interested parties) to assure the genetic purity and identity of the seed certified . . . ". This Amendment passed and was signed into law by the President on October 17, 1969.

It is my understanding that the intent of this Amendment will authorize the Secretary of Agriculture to approve the standards and procedures recommended by the AOSCA. These minimum requirements would have to be met by individual seed certifying agencies certifying seed moving interstate. Needless to say, this procedure should result in uniform standards and procedures used in certifying seed by the various official agencies. We hope this is the case. We know that it is needed.

Another change recently made by AOSCA involves a Certification Advisory Committee composed of representatives from the American and Canadian Seed Trade Associations; persons representing research in State Experiment Stations as well as USDA and Canada; both Canadian and United States Regulatory people; National Council of Commercial Plant Breeders and Seed Certification. This committee will advise the AOSCA on matters concerning minimum genetic certification standards.
as well as other items that may be referred to it for a recommendation. This will provide a good liaison between the various segments of the seed industry and seed certification.

For seed certification, I see a continuing important role for it to play in the seed industry. Not only to continue to provide the service of certifying seed (almost three million acres last year in the United States and Canada) but an additional role in providing variety protection under the Plant Variety Protection Act. Seed certification will continue its limited generation program developed during the last few years and maintain uniform genetic standards. In the near future, seed certification will be involved in "genetic purity only" certification for certain crops. That is, the certifying agency will certify to the variety purity based on uniform standards and leave the seed quality standard to be established by the seedsmen who will be "contract producing" most seeds.

The Organization for Economic Cooperation and Development (OECD) has developed schemes for the certification of certain crops. The United States is a member and as such has grown and shipped millions of pounds of forage seed under this certification program. The exporting of seed under the OECD label will continue to expand as new schemes for vegetables, cereal crops and sugar beets are put into operation. Seedsmen can look forward to taking increased advantage of this market.

The Certification Advisory Committee of AOSCA will be the liaison between the seedsmen, seed growers, certifying and regulatory agencies. This role will increase as certification becomes an ever increasing part of the seed industry.

**Plant Variety Protection**

Another legislative change has more recently been enacted. Public Law 91-577 provides the owner of a protected variety the right to exclude others from selling the variety, offering it for sale, reproducing it, importing or exporting it, or using it commercially in producing a different variety. Certain criteria of novelty, uniformity and stability must be met and the variety must be new to qualify for protection. If the owner so elects, the certificate of protection shall also specify that in the United States, seed of the variety shall be sold by variety name only as a class of certified seed and, if specified, shall also conform to the number of generations designated by the owner. The owner of the protective right enforces protection through private litigation, and infringement does not become a criminal offense. In the second type of protection (through seed certification) regulatory control of protection is included as a part of the Federal Seed Act which covers inter-
state commerce of seed. If uncertified seed of a protected variety labeled by a variety name enters interstate commerce, it is subject to seizure and the shipper is subject to criminal prosecution by a federal agency.

Both types of protection provide the owner of the protected variety with a means for licensing use of the variety and for recovering payments in return for its use. Protection may be obtained by private individuals, corporations of various sorts or by public agencies who might develop varieties.

There are numerous other provisions of the Plant Variety Protection Act that are important but time will not permit me to detail its operation further.

Needless to say, probably the greatest impact on the total seed industry of the future will be made by the Plant Variety Protection Program. Plant breeding, seed production, seed certification, foundation seed organizations, farmers and yes, the consumer will be affected.

For the consumer, he can expect continued supply of the food and fiber in ever increasing quantities at relatively low prices. The quality will continue to improve as better varieties are developed. The same will be true for the farmer. He can expect specialized plant breeding—resulting in varieties for specific needs with ever increasing performance efficiency.

No doubt, in the future, plant breeding or varietal development will be greatly influenced by the Plant Variety Protection Act. As the main purpose of the Act states in part, it is: "to encourage the development of novel varieties of sexually reproduced plants and to make them available to the public...". This will be done by the overall industry research program being vastly expanded. No doubt we can look forward to substantial enlargement of present industry plant breeding programs and to the entry of private breeders into breeding programs on crops heretofore considered unattractive because of lack of any control over the use of their development. There will be an increase in the number of firms or groups of firms into breeding efforts.

As for the impact of the protection program on public plant breeding, no doubt some agencies will look upon the program as a means of increased research funds by protection of released varieties and collecting royalties for their use. Not all Experiment Stations are expected to protect varieties and capitalize on them. Furthermore, I would guess that those that do, probably would be somewhat selective as to crops and varieties that would be so released.
I think that we will see plant breeders concerning themselves with differences which exist with their variety so that they can more accurately describe their product. The plant breeder must accept this responsibility which has always been his but one in which he has not necessarily done the best job in describing his variety. This cannot be properly done by laymen.

The varietal description supplied by the plant breeder for varieties to be protected are to be computerized. That is, in sense the description along with the deposited seed of the protected variety will be a germ plasm bank readily accessible through the computer. This will mean that in the future, we may know what we have available to work with from a breeding standpoint. In other words, eventually as most varieties are protected, we will have catalogued most all usable germ plasm and will know where to find it.

The Plant Variety Protection Act will have its impact for change in the additional roles of seed certifying agencies and foundation seed stock organizations.

No doubt foundation seed organizations may find themselves, in addition to being an arm of the Experiment Station in increasing their varietal releases, also being an agent in helping the stations protect and capitalize financially on such releases. Foundation seed organizations already have the mechanism for providing foundation seed to seedsmen and certified seed growers under an agreement specifying a royalty return to the organization based on amount of seed sold. This does not preclude the possibility that some Experiment Stations might find it profitable in some cases to effect exclusive releases to one or perhaps two seed companies.

In short, as appropriated funds for plant breeding research becomes severely limited, some state Experiment Stations may be forced into adopting a policy of protecting products of their programs in order to finance such research as well as support basic research. Such fundamental research must be continued. It is simply beyond the capabilities of private research and can only be done by public agencies. With this in mind it is imperative that the total seed industry continue to support through public agencies, such basic research.

**Conclusion**

In conclusion, I see a new dynamic seed industry. One geared to provide the consumer with his every increasing demand for quality food and fiber. As we strive to keep every link in the "seed chain" strong and moving forward as change dictates, let us not forget the consumer. The seed industry is fundamental to the total agri-business
community. I have confidence in this industry - it has had a good 20 years and I am sure of its future.