SEEDS FOR THE 70'S

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The next decade in the seed business will be the most exciting and challenging period in the history of our industry. We have only to look back at the building blocks of the 1960's that make up the foundation and launching pad for future developments to come to this conclusion.

While hybrid corn has been making its impact on our agricultural community for the last four decades, it was not until the 60's that we saw the effect in commercial channels of hybrid sorghums, and sudans, of hybrid carrots, onions, cabbage and other field and vegetable crops. Hybrid wheats and alfalfas were being developed as the 60's drew to a close. Gynoecious cucumbers revolutionized the pickle industry and our gardens were graced with hybrid flowers of dazzling beauty.

Truly the last ten years were hybrid oriented and the next decade will see a continuation and expansion of this trend. Just what is the basis for this headlong rush toward hybrid production of naturally open pollinated species? Obviously the seedsman was motivated by profit as a first consideration. With a hybrid he had built-in Breeder's Rights. Breeding efforts were protected from theft and propagation by competitors, and as long as he had a superior product desired by his trade, he could claim reasonable profit with less hazard of cut-throat price competition from lower overhead non-breeding firms.

Hybrids offered greater uniformity of plants, fruits and flowers, greater crop yields, improved disease and insect resistance, a more concentrated period of harvest and a greater tolerance to heat, drought and other environmental adversity. Much progress has been made through hybrid seed production in the 60's, but much more needs to be accomplished, and will be accomplished, in the future.

Many species of self-fertilized plants and those involved in natural crossing will be hybridized in the future. Every self-respecting plant breeder working with such species is diligently looking for male sterile aberrations to provide a base for a breakthrough into a hybridization program. Such germ plasm will be found and the breeding of new and novel hybrid types will further revolutionize our industry.

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Over the years great emphasis has been placed on breeding for improvement of crop yields, and rightly so. In the breeding of animal feed crops, much consideration has been given to the nutritional aspects of the grains and forages. Perhaps the greatest accomplishment of the 60’s in this area was the breeding of high lysine corn hybrids with their high protein value for stock feed and their value as well as a protein supplement for the diets of those populations around the world where the goal for each day is to obtain enough food for survival.

The 1970’s will see much greater emphasis in plant breeding for improvement of nutrient qualities of both animal feeds and human foods. Both the governmental officials of our country and the buying public are becoming more concerned with the food values of the groceries on the store shelves and the trend toward consumerism will continue.

In the near future we can look for regulations that will require the labels on the canned and frozen packages to list the complete food value information of the contents. Of course, some breakfast foods and baking products are already following this practice in their labeling and advertising. Unfortunately few of us are sufficiently concerned with the need for a properly balanced diet. We eat foods that taste good and have eye appeal. By the same token, if there was a choice in nutritional value between two cans of tomatoes on the store shelf, we would select the one with the best food value, if all other factors were equal. Such being the case, we should be breeding for nutritional value in our vegetables, grains and fruits. Sophisticated laboratory equipment, such as gas chromatography, will assist in selection in this upgrading program.

Mutants, both naturally occurring and those induced by irradiation and chemicals, have played a striking part in new varietal development in recent years. Disease resistance and improved yields have been produced in cereal grains through this plant breeding technique. As a result of this process, Pakistan is currently self sufficient insofar as its needs for wheat are concerned, and India hopes to be similarly self sufficient in its wheat needs in just a few more years. In Japan induced mutations were responsible for increased yields and higher protein content in rice to the extent that surpluses now exist there in that crop. A representative of a Japanese firm told me earlier this month that the national plan was to reduce the rice acreage in Japan by 10%, and they were looking for other crops to fill that acreage. Induced mutations as a breeding tool have not been used adequately by plant scientists to date. We can see much more wide-spread increase of this practice in the next decade.
Actually, I believe that insofar as "seeds for the 70's: are concerned, the pattern of varieties was largely set in the 60's in many species. It takes six to ten years, and even longer, to evolve a new variety. Add to that the years required to increase basic seed stocks to commercial quantities and the years required to promote a new variety into appreciable sales volume and we come to the realization that the new item that we are so proudly introducing today may well have been bred ten or more years ago. The necessary time lapse places increased pressures on the seed industry for accomplishment if we are to feed the masses of humanity in the next generations.

Let us pursue this line of thought further. What is the motivation for continued improvement in our seeds of the future? The strongest motivation possible -- survival! Survival in business against the keener competition of the future, but even more of consequence is the very survival of millions of people who are being brought into the world by the population explosion.

The world population now is around 3.2 billion. Thirty years from now, well within the lifetime of the majority of those in this room, the world population is estimated to be close to 7 billion -- more than twice the present figure. It is further estimated that two-thirds of the people living today lack adequate food, and great numbers die from malnutrition and actual starvation.

Let's bring the problem closer to home. The current census now underway is expected to show a U.S. population of 204 million. Just ten years from now that figure is expected to rise to an excess of 240 million. By the year 2000 the figure is estimated to be over 300 million. We may say that this is no problem to us -- that we can easily feed 300 million people here in our country. True, but we cannot ignore the fact that we are no longer an island unto ourselves. Hunger anywhere in the world is our problem. We must feed the starving wherever they may be, or as a preferred alternative, help them to feed themselves.

I repeat -- survival is our motivation for improved seeds of the future. If we are to insure that our children and our grandchildren will be enjoying an adequate food supply in their old age, the population explosion must promptly be controlled, and we in the seed industry will have to bend every effort in the development of better seeds to sharply augment the world's food supply. I don't want to be an alarmist, but these are the facts -- not speculation. The control of the population explosion in time to prevent hardship is wishful thinking, so the burden is on agriculture to plan now for an all out effort in years to come.
New varietal development in the future will follow several avenues of improvement. In addition to breeding for the increase yields and increased nutritional values mentioned previously, we will have to breed for greater disease resistance and insect resistance. It is becoming increasingly obvious that governmental regulations will drastically curtail the usage of chemical insecticides and fungicides in agriculture. With all of the emphasis now and in the foreseeable future toward improvement of the total environment, chemicals such as the chlorinated hydrocarbons, with great longevity of effectiveness will either be eliminated entirely from commerce or will be tightly restricted in their usage. It is difficult for me to believe, for example, that the application of 3/10 ounce of dieldrin as a seed treatment on 100 pounds of corn seed used to plant 10 acres of ground can constitute a pollution of our environment. Nevertheless, such seed treatment will be prohibited by law after December 31, 1970 unless extensions are granted.

There is no doubt that indiscriminate use of chemicals has, in some instances, polluted our streams and lakes and has threatened our wildlife. The total situation is emotionally charged and the words ecology, pollution and environment roll easily off the tongues of do-gooders and politicians who fail to realize the consequences of the total ban of the several chemicals on their "black-list".

Unfortunately there are no presently available substitutes of equal effectiveness for various of the chemicals planned to be eliminated. It behooves us all, therefore, to exert our influence in the Congress of the United States and in our own state legislatures to cause such legislation to be brought forth that will permit the restricted and controlled usage of these chemicals in agriculture in such a manner that environment pollution will be held to a minimum. As soon as other means of insect and disease controls can be effected through breeding of resistant varieties, through biological control of insects or through development of equally effective, though less offensive chemicals, the "hard" chemicals should be retired from commerce. Emotional and unscientific total banning of the chlorinated hydrocarbons at this time could work economic hardship on various segments of the agricultural community through reduction of crop potentials.

Breeding for the new varieties of the future must take into consideration the trends toward high density populations in field plantings. Such plantings may be in the form of closer row spacings, closer spacing within the rows or a precise and staggered planting with virtual elimination of the row effect. These higher density plantings offer greater yield potentials per acre, if all factors of nutrition, water and light are adequate. Since crop yields are directly related to the photosynthetic leaf area exposed to the sunlight, plants must be redesigned for high density plantings. The canopy effect of fewer
broad top leaves must be replaced with smaller leaves and a more erect and open plant structure to allow light penetration to the lower leaf surfaces. Such a plant also allows better aeration within the mass of plants and a reduced fungal and bacterial disease potential.

Our row crop culture was largely built around the concept of the horse as a source of power for planting, weed control and harvesting. With the abandonment of that concept the redesign of the plants and farming equipment to permit precision planting higher density field population will result in greater per acre returns.

Feeding the increasing populations of the future will require the farming of land not considered marginal for agriculture. Varieties will have to be bred with greater tolerance to heat, drought, cold and to a wider range of soil types. To accomplish these ends we should take advantage of the germ plasm bank maintained by the Plant Introduction people in the U.S.D.A., in our breeding programs and, as previously mentioned, utilize the tool of induced mutations to give us a new source of germ plasm.

With our expanding world markets for seeds we must plan our breeding programs of the future to provide varieties more suited to the environment of the foreign countries and the customs and tastes of their people. We have to recognize that our varieties are not always acceptable to them and, with that knowledge, try to match their requirements instead of attempting to arbitrarily foist upon them the items that are successful here at home. The sooner we recognize this fact and proceed to do something about it, the sooner our foreign sales volume will increase. The economic concept of consumer sovereignty whereunder the will of the buyer is the ruling factor in marketing success applies overseas, as well as at home.

During the next decade we will see greater use of precision planting equipment of various designs and seeds so planted may be coated with nutrient materials, insecticides and fungicides to provide an ideal environment for early growth. Unless seed for such sophisticated planting is of high vitality and close to 100% germination, much of the benefits of such a planting program are lost. The pressure will be on the seed industry to provide the higher level of seed quality required.

To meet such requirements we will have to breed seeds that are genetically more vital under a wide range of growing and storage conditions and are less susceptible to mechanical injury in harvesting, processing and handling. Controlled drop tests whereunder the seeds are dropped a measured distance to a hard surface helps to reveal those seeds which can withstand the greater impact in these processes. Most seedsmen are breeding and selecting for such seed quality improvement and the varieties of the future will be of higher germination in many species.
Threshing techniques and equipment must be improved to minimize harvest damage to seeds. Perhaps the most significant development in this regard is the rubber belt thresher which offers real promise for reduction of thresher injury. A number of plot threshers embodying this new threshing principle have been in use by Federal and State experiment station personnel, as well as by private seed firms for some years and a full scale machine for field use has been constructed by the U.S.D.A. engineers in cooperation with Oregon State University at Corvallis, Oregon. In this machine the threshing cylinder has been replaced by two wide rough-surfaced belts running at different speeds in close proximity to each other. The threshing action closely simulates the rubbing out of the seed between the palms of your hands and the injury to the seed is minimal. Thorough and gentle threshing has been accomplished on seeds ranging from small grass seed to garden bean seed. Further refinements in this machine and encouragement of its usage for seed crops can go a long way toward assisting the seedsman in reaching his ultimate goal of seed with 100% germination.

I am sure that other speakers on this program will tell you about improved seed processing equipment for the 70's, so I will not inflict on you my thoughts on this subject. I would like to mention though the widespread usage and the value to our industry of the electronic color seed sorters of various designs. Perhaps the 1970's will witness the invention of an electronic device that will make a practical seed separation on the basis of vitality and germination. Such a breakthrough would be a great assist to our industry and to agri-business in total. We will soon have equipment and techniques that will obsolete our present germination equipment and give us immediate readings of germination and vitality. Seed plants will be automated to a much greater degree and the computer will become a standard tool in research, marketing and management.

The 1970's will see a continuation in the trend toward larger and more specialized farming operations. Such farms with "more eggs in one basket" are going to be more conscious of the need for quality seeds provided by a progressive seedsman who is a specialist in the seeds that he offers for sale. The farmer will expect to have expert advice regarding varieties and cultural practices and the seedsman who can offer such sound technical advice along with improved varieties is going to prosper.

Frequent reference has been made in my presentation to plant breeding as a solution to the ills of the seed business and the problems of feeding the added billions of mankind in the future. I firmly believe that the plant breeder with the vision and the courage to make trends rather than to follow them will open new avenues in the plant sciences. He will be the basis for the future success of our industry and the means by which the stomachs of the masses of humanity will be filled.
One vital ingredient is necessary, however, to make the efforts of the plant scientist possible. That ingredient is money. Money to pay salaries and to purchase the tools for research. In the hands of Congress in Washington now is the means by which research of the future will be financed -- not a massive appropriation funded by taxpayer's dollars, but a program of Breeder's Rights that will enable the fruits of the present breeding efforts to finance the enlarged scope of plant breeding in the future. We have only to look at the success story of hybrid corn to realize that the built-in Breeder's Rights that hybrid seed offers has created a new and vital industry that is built on research financed by legitimate profit margins.

Unfortunately the majority of our field and vegetable crops which are propagated by seeds are bred, produced and marketed without benefit of breeders' rights protection. A seed firm spending hundreds of thousands of dollars annually to breed new varieties has them stolen by other seed firms -- many of which do not have a breeding program of their own. Without the high costs of breeding and promotion of new varieties such firms soon buy a share of the market with reduced prices. It is not unusual for the breeding firm to claim only 50 - 60% of the market on its own new variety within three to five years after its introduction.

Obviously, the pyramiding costs of research will not permit this situation to persist without detrimental effects upon the future progress of our industry. The plant breeder must have the right to a just return on his inventions in exactly the same manner as the inventor of a machine or the composer of music is protected and rewarded.

Let's speculate for a minute on what changes may evolve in our industry when an effective breeders rights bill such as is now in the hands of Congress, or in some reasonably similar form, is enacted and becomes law. Almost certainly the tempo of plant breeding will be sharply increased as a result of the opportunity for the breeder to profit from his innovations, just as it has in Europe where breeders right protection has been established. New and improved varieties will be developed and the profits therefrom will finance a pyramiding effort toward greater volume of research - all to the benefit of all mankind.

Seed firms not now engaged in research may well elect to follow one of the following courses of action, any one of which will probably enhance their present condition.
a) Launch a breeding program of their own

b) Join with other small or large firms in a joint venture breeding program

c) Seek growing and marketing agreements with breeding firms.

With the existence of breeders rights protection, public agencies may either elect to concentrate on usage of public funds for much needed basic research and abandon actual commercial varietal development to private firms, or, emphasis might be put on varietal development with the hope that royalty payments generated therefrom might provide much needed funds for further research.

There will be problems of administration of any breeders rights that is passed. That is certain, but I believe that the thing that is of importance is that for the first time the agriculturally oriented segment of our country, both the public and private sectors, has taken concerted action on a program of breeders rights. I am confident that protection for the breeder will soon be an actuality here in the United States and the world will be a better place in which to live because of it.

The seed industry of the 70's and the decades to follow offers excitement and the promise of progress to all who have the foresight to plan now for the future.