Seeds - A Key Component In Increasing Food Production

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It gives me a great deal of pleasure to participate in this symposium on seed production. I would also like to say Mr. Ambassador, that we in CIMMYT are greatly indebted to the role that the Royal Government of the Netherlands has played and continues to play, both in respect to seed and in monitoring the diseases that are an integral part of the total small grain production systems.

Regarding seed production I have been surprised at the amount of small grain produced, especially wheat and rice, in the last 10-12 years in the Near East, Middle East and North Africa. If some one had told me in 1965 that there would be this kind of progress, I would have been very sceptical. However, this achievement does not mean that we should be at all complacent; on the contrary, because of the growth both in population and the demand for more food, we must strengthen our efforts if we are to stay ahead.

Seed of the new improved varieties are catalysts for change and when properly used together with all the components of the package of cultural practices, food grain production can be increased dramatically. In order to become a production reality,

the seeds and the whole package must be married to a sound economic policy. Such policy will stimulate the adoption of that technology by the small farmers and consequently can increase production beyond their own needs, with the excess being available for sale in the market place.

That policy I think Mr Ambassador clearly emphasizes the political will which is tremendously important. It applies to all aspects, starting with the availability of people, the provision of credit for the small farmer, and some assurances of a reasonable price for the grain at harvest time.

The reason why I say that the high yielding varieties are catalysts for change is that there seems to be some mysticism involved in what they have within them. Although they have the ability to express their genetic yield potential if they are properly planted, this does not imply the use of expensive inputs like fertilizers although that is certainly one of them. In many countries, I have seen that with a given unit of fertilizer such as 40 or 60 kg of nitrogen, the old varieties very often with 60 kg will produce much less than applying the same amount to the new varieties that have the correct straw to grain ratio.

One factor that is very significant in plant breeding relating to seed production is adaptation. From the outset in the wheat program in Mexico, CIMMYT endeavoured to develop varieties that had a relatively broad adaptation. It was recognised that it would take a long time to get a new variety into 30 different ecosystems, with each one being rather specific.

Without going into the details of breeding the new varieties, our system was simply one of moving seed from low elevation to high elevation growing areas in alternate generations of selections, and across about 10 degrees of latitude. Also, each successive generation was subjected to a different group of pathogens that were more prevalent in one area than in another.

Over a long period of time, it became apparent that not only in Mexico was there this broad adaptation but when these seeds were grown in other countries they also performed surprisingly well there. Adaptation is only one aspect of seed, and it is very important.

There are several basic considerations which must be included in seed programmes in order for a big impact to be made on food production.

Up to a point, there must be varietal purity. Seed must have farmer acceptance, and from the standpoint of industrialization which is proceeding at a rapid rate in the large cities, grain must be more or less uniform in hardness, colour and texture. But many of the botanical features that are useful to identify varieties are only of secondary importance in the third world developing nations because such features have no relation to food production.

This is the difference in points of view in agriculture between the developed and the developing nations. However, do

not misunderstand me and think that purity is unimportant. When there is 5 per cent impurity in a crop and if the impurity matures three weeks later than the 95 per cent component, the farmer will be inclined to wait for that 5 per cent portion of later maturing plants to ripen, even if it is a hand harvesting operation. In the process, the 95 per cent part of the crop becomes vulnerable to many deleterious factors — birds, wind and hail during those three weeks. I believe that within reasonable limits, seed purity is less important in the third world nations than in the developed nations.

One matter which I have frequently seen that has caused near ruination is lack of high germination. I have seen it nearly wreck programmes in Mexico, India, Pakistan, Argentina and Tunisia. Seed germination percentage can be influenced by the nature of seed receival and distribution systems and organizations.

Until recently at least in many of the developing countries, it has been the political philosophy that the seed receival and distribution programmes be in the hands of the public sector. Almost always this has been one organization in that sector. If that organization does not function properly, either because of the lack of trained people or the lack of organizational control and if seed is fumigated at excessive dosage rates for example, the result is disastrous.

If however there were competition, whether it be between two or three state agencies, or a university and a federal government, or state government agencies. Then I think that

a certain amount of extra caution is generated.

The distribution of weed seeds with improved agricultural seeds is another aspect that has contributed a great deal to the negative side of agricultural production. For instance, more wild oats have been spread around the world with wheat seed than probably by any other vehicle. The distribution of Phalaris major is another example. When I first went to Mexico, I never saw it there. Now it is spread throughout much of Latin America, the temperate areas and the semi tropics. I believe that it entered Mexico originally in alfalfa seed. Phalaris seed is light and it floats on water. Irrigation canals have spread it like fire across the whole country side.

There is a need for good linkage between research, seed multiplication, distribution, quality control, entomology and pathology programmes. Let me briefly explain why.

In the first place, those who are involved in seed multiplication need to know what is in the immediate forefront for release to replace the best varieties that are currently being grown in farmers' fields. I have seen in Mexico, and I assume that it would be true elsewhere that the government seed programme that was a national monopoly originally, but is no longer so, would always be caught with their warehouses full with obsolete varieties. Consequently when research people proposed varietal changes the recommendations did not go into operation immediately. In fact, there was a delay of 1-2 years while the government seed organization made up its mind regarding what to do over its full warehouses.

Such time lags represent a period of unnecessary vulnerability to rust pathogens and the possibility of an epidemic building up.

In order to cope with such situations, a seed policy programme involving the release of new varieties has to have great flexibility, dynamic leadership and the joint judgment of the seed programme director, the research programme director, and plant breeders and plant pathologists.

If there is a need to plant two multiplication generations a year in the first stage, it can be done by using a suitable offseason site at a higher elevation where temperatures are favourable for spring wheats. This was done in 1964 with Sonora 64 wheat which even although it was not the best variety, it set the stage for what was to be a dramatic increase in seed production.

At the end of the 1963 summer season, 100 grams of seed were available from the breeders' seed multiplication experiment station. Ordinarily it would have been planted in mid November at a low elevation on the west coast of Sonora State in Mexico. Instead, it was planted in mid October in our main station. On February 15, 21 kg were harvested and on March 1 on the same station, 19 kg were planted thinly in beds which were inter row cultivated. (Two kg were retained for quality testing). On June 1, we harvested

2 metric tons of seed which were then planted at our high elevation site. At the end of September we harvested 150 m.tons — within one calendar year from the original small sample. By contrast only 4 m.tons were harvested from the conventional seed multiplication method, in one year.

There have been several occasions when there have been near disasters in seed production programmes. For instance in 1947 in Mexico, a new variety exhibited a low germination capacity. This variety had been multiplied in the previous year for subsequent release to farmers. When the poor germination was investigated, it was found that the seed had been fumigated with a double dose of methyl bromide in the warehouse. Complete disaster in the field with this seed was averted by doubling the seeding rate.

Another example of fumigation overdosing occured with the shipment from Mexico via Los Angeles of 350 m.tons of seed to Pakistan and 300 m.tons to India, in 1965. The first plantings germinated poorly. Telegrams were then sent to all the places where the seed had been distributed with instructions to double the seed rate and to apply more fertilizer. Fortunately an excellent response was obtained which resulted in India importing 18,000 m.tons in 1966 and Pakistan importing 42,000 m.tons in 1967. Tunisia also suffered a seed programme set back for several years due to over fumigation.

A good plant breeding programme is not a very good investment if there is not a good seed production programme linked with it. They have to go hand in hand.

Regarding maize, one of the biggest bottlenecks to progress in increasing maize production in the Third World has been narrow adaptation. This has resulted in there being too many varieties for a given area. All too often variety A which should be grown in ecosystem A, ends up in ecosystem Z, and vice versa.

Fortunately within the last 4-5 years this has all begun to change. The Maize Program at CIMMYT has developed open pollinated varieties that have a much greater breadth of adaptation. They are more easily managed and they will lead to rapid changes in maize production.

In conclusion, it should be recognised that programmes on seed multiplication, distribution and quality control are still weak; more trained personnel are required; better physical storage conditions are needed; improved linkages between the breeding and seed multiplication programmes are necessary, and better disease monitoring and advance disease warning systems to get new varieties multiplied, are also required.

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