

A Brief Report on the All-India Coordinated Wheat Scheme

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THE 1968 HARVEST

India is now harvesting what appears to be a record-breaking wheat crop. Exceptionally favorable winter rains have both expanded the area under cultivation to something approaching 35 million acres and have contributed to the over-all excellent development of the crop. There are no completely accurate data concerning the full crop expectancies. We did, however, hear several statements that the crop may exceed 17 million metric tons. This is a fantastic increase over the 11-1/2 million tons that were harvested in the 1967 crop season.

Although favorable rains contributed much to the excellent crop that is now being harvested, the widespread application of the intensive cultural practice package built around the high-yielding dwarf varieties that were introduced from Mexico is clearly an important factor also. It is estimated that about 18 percent of the area, or approximately 6 million acres were sown with these varieties and grown under the intensive package plan. This acreage will produce approximately 38 percent of the total grain harvested. The problem for the next year, therefore, becomes one of trying to expend as rapidly as possible the intensive package of cultivation of the high-yielding varieties, especially in the irrigated areas. Attempts should be made to cover most of the irrigated area with this group of varieties under intensive cultivation during the 1968-69 crop season.

Actions needed in order to maintain the momentum which has been generated during the last crop cycle.

Floor Prices. The government has announced floor prices that are or appear to be at a stimulatory level. The problem now, however, becomes one of defending these floor prices in order to stabilize prices at harvest time. The old food zones which inhibit the free movement of wheat from zones of major production into zones of deficit will now act adversely on prices. Gluts in the major producing areas are almost certain to occur unless the zones are abolished promptly, thus permitting wheat to flow into those areas where there is shortage and a strong demand. Adequate credits are needed immediately for defending suitable price supports. The government is also faced with the acute problems

both of temporary and of permanent storage facilities. Little can be done at this late date to expand appreciably the permanent storage facilities, but temporary storage can be provided by constructing raised platforms made of brick and cement on which a retaining wall of sacked grain is used to retain loose grain in the center of the platform; this will give the wheat adequate protection for two or three months if plastic covers can be provided. Such covers can be made by sealing thermoplastic sheets on the site. Whenever temporary storage is used, it is of utmost importance that only grain of low moisture content be stored in these temporary shelters and that protection against rodents be provided.

EXPANDING THE AREAS UNDER THE INTENSIVE PRACTICAL PACKAGE PRODUCTION PROGRAM FOR THE 1968-69 SEASON

The area under the intensive package program, now about 18 percent of the total wheat area must be increased to 33 percent of the total or roughly 11 million acres, during the 1968-69 season. At the present time, most of the areas in the intensive package program are near a few effective research, extension, and education centers; such as the University of the Punjab at Ludhiana, the University of Uttar Pradesh at Pantnager and the IARI in New Delhi which has been under the direct influence of the extension program of this institute. The program in the spheres of influence of Universities of Punjab and U.P. are perceptibly more advanced than in other areas. The Ford intensive agricultural district programs have had a strong influence in promoting the adoption of the package programs. The job to be done in spreading this package into many new areas for the next year is extremely important but also of tremendous magnitude. This spread will not take place at the desired rate without additional effort. The additional effort could be supplied partly by procuring the services of Dr. Dirk Leeurick, of the Ford Foundation, to assist in "training of the trainers" (extension workers) at the established centers of extension, such as the University of Punjab, the University of UP, and others. Dr. Leeurick is a capable scientist who has the knowledge and experience needed in this training effort. In order to carry out this possible function, he would need a modest working budget, one mobile demonstration unit that can be self-contained on a pick-up truck. On our recent trip, it became self-evident that there are vast areas where this program was completely unknown. We did not see appreciable acreage of the new improved varieties on the route from Delhi to Hissar as an example; nor was there much evidence of improved practices and varieties along the entire route from Delhi to Pantangar until we approached the zone of influence from the University of UP.

Dr. Leeurick might play an important role in extending the type of demonstration now being made near the centers of influence into the irrigated areas, which must be accomplished if the production revolution is to progress vigorously. Obviously, Dr. Leeurick should cooperate closely with Glenn Anderson and John Wright.

Another important aspect of extension demonstration that needs to be carried out is the use of improved varieties and proper fertilizer practices on barren lands. Heretofore thought has not been given to promoting this aspect of wheat improvement. Again, this is a phase of the program that Dr. Leeurick might help in developing.

PRERELEASE MULTIPLICATION OF NEW VARIETIES

It is strongly urged that from five to ten of the highest yielding, most promising varieties from the current yield tests be placed in preliminary prerelease multiplication tests during the forthcoming summer. These prerelease multiplications should be conducted during the Khariff 1968 season under the supervision of a government agency. No adequate physical facilities have been provided for such multiplications at the present time. Secretary Subramaniam indicated his intention to authorize the National Seeds Corporation to assume such responsibility. We urge that this be implemented immediately.

It is important in the prerelease multiplications, as well as in the multiplications of all breeders foundation seed stocks, that close attention be given to seed purity and quality. Mixtures cannot be tolerated. Close supervision is needed by competent scientists in order to assure purity and quality. If Dr. Glenn Anderson does not have adequate time to devote to this activity, then it is suggested that perhaps Dr. Leeurick in part could assist the Indian officials who are charged with this responsibility.

NEED FOR IMPROVED PHYSICAL FACILITIES FOR THE SUMMER BREEDING NURSERIES AND FOR SUMMER MULTIPLICATION

The only facilities now available for summer breeding plots and for summer multiplication are in the Nilgiri Hills of southern India. These facilities have several limitations: first, the amount of suitable land is limited, being restricted to small terraces; secondly, the location is such that during the ripening and harvesting period there is constant fog and rain which complicates harvesting and leads in many cases to germination of kernels in the head, thus interfering with program procedures of the breeding program. Although continuing to use present facilities during 1968, we urge that provision be made for establishing in the northern hills a permanent breeding station, including enough land for prerelease plots. It is our conviction

that no single governmental action is more important to the long-time welfare of the All Indian Coordinated Wheat Scheme than this recommended action.

PRESENT AND POTENTIAL DISEASE AND PEST PROBLEMS: THE URGENT NEED FOR ADEQUATE WHEAT-HEALTH MEASURES

Without being alarmist we would be remiss in our duty if we did not warn against imminent and potential dangers of diseases and insect pests. There must be adequate and constant vigilance to insure as much as humanly possible against surprise attacks of pests and pathogens and their debilitating or devastating effects. Because of the great diversity of viruses, bacteria, fungi, nematodes, and insects that can, either alone or in combination, depress yields or destroy plants or their parts, the problems of disease and pest control often are extremely complicated.

Many of the pathogens of wheat are extremely diverse genetically, comprising numerous parasitic races that differ greatly in their virulence for different varieties, that can multiply with amazing rapidity, and that can be carried far and fast by wind, insects, or by man himself. Because of mutation, hybridization, or other forms of genetic change, new races are continually being produced, and, in many cases can spread over large continental areas in a single season. There is always the danger therefore that new races, produced within a country or coming as invaders from another country, may attack hitherto resistant varieties.

The situation is further complicated by the fact that many pathogens and pests may be very variable in their effects under different soil or climatic conditions and the nutritional status of wheat. Accordingly, there can be wide regional and seasonal differences in disease and pest development. Only after having been grown for several years in different ecologic areas of a country, therefore, can the reaction of new varieties be sufficiently known.

Stem rust is still the greatest known menace to wheat. It is a killer disease when virulent races are present and weather conditions favor their development. As many parasitic races are known to be present in India, and as new ones may appear, it is of paramount importance to incorporate as many different genes for resistance into varieties. Brown rust and stripe rust also can be damaging, but are less catastrophic in their effects than stem rust.

Diversification of rust resistance. With the outstanding crop that is about to be harvested with the varieties, Kalyan-Sona, PV 18, and Sonora 64, in all likelihood, there will undoubtedly be a vast increase in the area sown to those varieties during the 1968-69 season. There will, however, be increasing influence of certain other new varieties, such as 1) Sonalika (S308), 2) Safed Lerma (S307), 3) S331, and 4) Sharfati Sonora, which will be helpful in diversifying the types of rust resistance now available in improved commercial varieties.

However, more diversification in rust resistance is urgently needed: This should be obtained as soon as possible through the rapid multiplication of at least half a dozen of new varieties with different types of resistance. You will recall that last year in the summer nursery in Kalam, West Pakistan, a race of stem rust heavily attacked the Pakistan variety, Mexipak, which is equivalent to Kalyan Sona. On our recent trip to the southern part of West Pakistan, it became evident that there is a race of leaf rust, present in the Sind that can attack Indus 66 (P.V. 18) and Mexipak 66, equals Kalyan (Talion Sona). Although there was no commercial loss from this leaf rust race this year, but it forewarns of the dangers of restricting our commercial acreage to one or two types of varieties.

THE RUST SURVEY, ITS IMPORTANCE AND FUTURE IMPROVEMENT

During the past season, for the first time a systematic rust survey was made in commercial fields of wheat-growing areas. It is of utmost importance that such surveys be made annually and be placed on a more effective and permanent basis, with close coordination of effort between all scientific personnel of the All India Coordinated Wheat Scheme, the National Plant Protection Organization, and all other necessary and competent State and Central Government agencies. It becomes even more important as wheat culture is intensified and as the rust hazard becomes graver because of the more favorable ecological conditions provoked in a large part by the use of heavy doses of chemical fertilizer. Dr. Eugene Saari Ford Foundation, gave effective assistance in the development of this program. We hope that his services may be available again next year to help improve the survey on the basis of his past experience, as there are still many defects in the survey organization.

Need for strengthening the plant pathology work to support the wheat breeding program. The greatest weakness in the All-India Coordinated Wheat Scheme is the lack of development of a good plant pathology program to support it. There are inadequate facilities for doing rust testing. It is suggested that the race identification work which is now done in

the laboratories and greenhouses at Simla be concentrated as soon as possible in growth rooms at the IARI in New Delhi. By so doing there can be closer coordination to screen all of the promising materials entering Rodrows against individual races of the rust organisms. Obviously effort should be made also to ascertain what degree of generalized resistance or tolerance against all races may exist in seedling plants and older ones.

Other disease problems that need attention

Although it is absolutely essential that everything possible be done to insure against catastrophes such as stemrust has caused in the past and still continues to cause in numerous countries. The second and third greatest present menaces, attention to brown rust, and yellow rust, should have second and third priority.

Other diseases or groups of diseases, in approximate order of priority, are discussed briefly.

Leaf spots and blights. There are several leaf spots and blights that are potentially important, although too little is now known about the role that they may play.

Among them is the alternaria blight. Numerous statements are made about the destructive effects of this fungus, apparently without enough evidence to support some of them. The situation should be clarified by ascertaining the possible relation of nutrition to the disease. Is alternaria a virulent parasite, or does it attack primarily plants that are already debilitated somewhat by poor nutrition? How important is varietal resistance to the organism, or can its effects be mitigated sufficiently by the use of fertilizers and good cultural practices? The possible role of minor elements should also be determined. The same questions apply to Helminthosporium, Septoria, and other similar organisms.

Loose smut. This is a pathological if not actually a pathological problem of high priority in India. Extensive studies on the effectiveness and "economics" of the new fungicide, Vitavex, should be continued. If present evidence of its effectiveness is supported by additional experimentation, the breeding program can be relieved of the necessity of giving high priority to resistant genes against this smut.

Virus diseases. Unfortunately, the present and potential importance of virus disease is not well known. The symptoms of what

some pathologists consider a widespread and debilitating virus disease are so similar to symptoms of nutrient deficiencies that field and greenhouse, especially adequate field tests, should be made at once to clarify the situation. It is urged that a good agronomist-breeder and soils specialist cooperate with plant virologists in the studies.

Ear cockle. Too little is known about ear cockle, alone and in association with other organisms. There are indications of varietal resistance to the ear cockle itself or its associates, but more definitive information is needed.

Root diseases. Root diseases must always be given attention in wheat improvement problems. That there are root diseases in India, whether caused by nauntoden, fungi, and other pathogens, or by micro element or other chemical deficiencies or toxicities, each alone or in various combinations, is evidenced by the condition on the Singh Farm near Ludhiana, which all of us have seen. A competent team of various specialists should investigate this condition and close watch should also be kept for indications of similar conditions elsewhere.

In summarizing, it appears that there are a large number of plant pathological problems affecting wheat production and that more information must be obtained about their role in the wheat improvement program.

FINAL APPROVAL AND FUNDING FOR THE ALL-INDIA COORDINATED WHEAT SCHEME

The scheme referred to in this title is still hung up in red tape and bureaucracy. It is ridiculous that after more than three years this plan although approved in principle has not been finally approved and has not yet been funded. The results that are clearly evident this year on the contributions of the All-India Coordinated Wheat Scheme should speak for themselves. It would be tragic to retard further progress by delaying action in this matter. It merits the most prompt action on the part of the Government. We urge both of you to use every effort to see that this scheme is officially sanctioned and funded by the Indian Government at the very earliest possible date.

CONSULTANTS OR PARTICIPANTS

Dr. Eugene Saari, and Dr. Dirk Leurick should become active participants in extension and/or research extension activities or they

will be ineffective. We are firm believers that scientists must be participants rather than isolated consultants if they are to be effective in an agricultural technical assistance program. It is our opinion that these two men could contribute much more to the program than they are now doing.

CONCLUSION

We submit this brief report for your consideration, realizing that our visits were so short and concentrated that we may not have learned some detailed facts that might have been pertinent to our conclusions. Nevertheless, while admiring the progress already made, we do feel that the suggestions we have made for improvement are soundly based, at least in principle.

It is extremely important, finally, to work constantly toward complete concentration and coordination of effort between the Foundations, and all Indian agencies, bases on clear understandings, explicitly expressed and recorded. And we urge also that the same principles of understanding be applied to all participating individuals, in order that they may know their obligations and privileges, so that they may work most effectively, individually and in cooperation with others.