

Crop improvement research in India—role of public institutions in emerging scenarios

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The national economy is causing concern to everyone. A major component of our economy is agriculture, which even today contributes more than 35%, despite a decline over the years, to the gross national product. The absolute contribution of this sector to the national economy continues to increase substantially. However, the importance of agriculture in India lies much more in the fact that it provides the maximum occupation and also serves the needs of urban people, giving them a feeling of food security. This is important for us for maintaining our self-respect in the world. What are the prospects of maintaining these objectives of our economy?

India, since independence, has moved from a state of subsistence to food sufficiency to food security. The process occurred because we had a long tradition of agricultural research in the country. The first major institution, the Indian (Imperial) Agricultural Research Institute was established in 1905 at Pusa, Bihar, and moved to Delhi in 1936. The scientists of the institute made valuable collection of land races and developed varieties of different crops. They established water requirements of various crops, also studied nitrogen fixation, fertilizer management and plant protection aspects of crop production. This country developed wheat varieties in the thirties and fifties which served as parental material in other parts of the world. The NP (Pusa) wheat varieties became renowned because they were resistant to all rusts. Commendable work was earlier done in sugarcane, and subsequently in other crops. In these programmes plant breeding constituted a major component of an integrated research programme of crop improvement including pathology, entomology and agronomy. Thus, when dwarf varieties of wheat and rice became available, Indian breeders could quickly convert them to desirable types and other scientists developed the package of practices. Despite enormous success and name, no

plant breeder or agricultural scientist left the research institutes to take up a job with any private organization, because no such organization existed.

In the last few years two important events have happened: (i) emergence of plant biotechnology and (ii) emergence of private seed industry. While both these events are signs of progress in science and industry, they may as well become a threat to plant breeding and crop improvement research. The agricultural research institutes including universities have been instrumental in releasing all varieties of crops in India. The Indian Council of Agricultural Research (ICAR) has played a vital role in the last four decades by developing a mechanism of coordinated projects wherein scientists from different disciplines such as plant pathology, agronomy, entomology, physiology, microbiology and others make a joint effort for developing a package of practices for farmers. Thus the farmer, through extension services, has the possibility of getting the benefits of integrated knowledge and technology. We had, and we still have, a large expertise in conventional plant breeding wherein a plant breeder selects plants in the field and assesses its performance under very diverse conditions. Despite repeated statements by competent scientists in the country, an impression has got created that a new generation of varieties with all desirable traits would be produced through genetic engineering and biotechnology without involving conventional plant breeding techniques. This becomes a very attractive and imaginative idea to produce wonderful plants through laboratory work alone. The result is that a far greater number of students, and brighter ones, are attracted to molecular biology and biotechnology than plant breeding. We are now reaching the stage when the stalwarts who led to the green revolution have either retired or are near retirement. They are not getting replaced by equally competent, enthusiastic and field-committed scien-

tists. If the process continues there would be fewer and fewer young persons getting into plant breeding. This is not to suggest that we do not have young scientists who are bright and willing workers, but the point is that the number of motivated plant breeders is decreasing because something else has become more attractive, and often more paying. There are more opportunities to travel and work in foreign laboratories in the fields of molecular biology and biotechnology. The latter is desirable because it is providing excitement and insight into the functioning of processes and expression of traits. Therefore, today the question is how to take advantage of modern biology as well as that of proven conventional methods of crop improvement. This may be possible if leaders in agricultural research could recognize this as an important problem of human resource development and introduce corrective measures. An important approach to this could be to retain all plant improvement research under the banner of genetics and crop improvement.

Emergence of the seed industry, while a welcome step, has the greater potential of causing disturbance to plant breeding and crop improvement research in the country. Crop improvement is a continuous process in which plant material and practical knowledge have been passed on generation after generation. Through strenuous efforts plant material has been collected and some of it has been evaluated in the past several decades. A scientist of today gets the benefit of this germplasm collection and evaluation while planning his/her research programme. There was never a need either to register or to patent this material because every paisa for research came from public funds. If one were to evaluate the cost of wheat germplasm, which is conserved and described, it would be near impossible to develop a satisfactory economic methodology, except possibly to say that it would be enormous and phenomenal.

With the exception of a few private seed companies which have a back-up of research, but not necessarily of sufficient well-described germplasm, there can be no future unless fair or unfair means are found to move plant material from public institutions to private industry. A country which abounds in unemployment and underemployment or inadequate remuneration, increase in salary by two- or three-fold could be a great inducement to many scientists. After all, these scientists are also part of the society, who are looking for better comforts and cannot be completely faulted if they grab such opportunities. When they move to private institutions, they would be tempted to carry the material they generated and also obtained as a legacy. They might forget that the material that they carry has the contributions of earlier scientists, technical, field and administrative staff. The movement of scientists from public institutions to private institutions or private industry is already a reality. Would the new generation of scientists get the desired support from their scientist colleagues, technical, field and administrative staff? The absence of continuous flow of genetic material from public to private institutions would lead to redundancy of the acquired plant breeders in private industry. In the process, scientists in public institutions would have felt discouraged and demoralized because the fruits of their efforts would be in the hands of those who had very little

history of organized research. This can have two repercussions: the collection, maintenance and use of germplasm by private industry depending upon their capacity to invest money and a long-term survival of the individual company. This means that crop improvement research in private industry would flourish and attract more and more scientists from public institutions. This can have a serious impact on teaching and research in universities. In the process, the crop improvement research would suffer in public institutions which have brought the country to the present stage in food production. One shudders at the possibility of the Indian Agricultural Research Institute (IARI) being sold, as has happened with the Plant Breeding Institute, Cambridge, UK.

We have to accept the fact that the private seed industry has come to stay. What happens to the national agricultural research system, particularly the crop improvement programme, is not their major concern. The only alternative is to develop a mechanism of competition rather than confrontation. I suggest that ICAR or the large institutes such as IARI float their own companies which would have shares of all the employees of the institute. Whatever variety or technology is developed, should be propagated by this company. For example, this company having the scientific and technical backup of the institute would produce, process and market the seed material to farmers. The company would initially be allowed to use the infrastructure of the

institute, except marketing. The profits of the company would be distributed on the basis of shares among all employees, including scientists, technical, administrative and supporting staff. Therefore, all categories of staff would be interested in the success of the institute. This would, however, have the danger that the research of the institute may get directed to applied aspects alone ignoring basic science which is the foundation of applied research. For this reason the basic research will continue because it is through this mechanism alone that the research institute will be able to keep a lead over private industry. The fact does remain that the institute will provide a complete back-up as well as a package of practices based on experimentation in different regions. This will be different from an organization such as the Seed Corporation of India, whose main function is to produce and market seed. They have no back-up of package of research as well as no direct interest of their employees.

The present proposal can serve as a competitive system to private industry and ultimately force them to organize their own research programme effectively. This ultimately will help in maintaining a self-reliant crop improvement programme in the country.

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