

The Framework and the Fabric of Agricultural Research

Professor Ralph Riley, Director of the Plant Breeding Institute at Cambridge, argues that a substantial amount of agricultural research must necessarily be carried out on a long term basis, in contradiction to Lord Rothschild's proposals.

THE uninitiated might infer from *A Framework for Government Research and Development* that the research councils have failed to deliver the goods packaged in forms that produce economic benefit to the community. This is demonstrably not true for a great deal of the work of the Agricultural Research Council, and it would be a serious injustice to many past and present members of ARC staffs if their achievements were disregarded so disdainfully. In the field of plant breeding, with which I am most familiar and to which reference has been made frequently in recent weeks in the columns of *Nature*, the economic benefit has been considerable.

For example, in the wheat crop, which was worth about £120 million in 1971, two recently introduced varieties yield 9 and 10 per cent more than any other available variety. If only part of this is realized in farm practice, this ARC-supported programme will obviously have been effective, particularly since it also produced two other widely grown varieties.

In 1968, Dr G. D. H. Bell was the first recipient of the Mullard Award of the Royal Society, which is given for work that has led directly to an increase in the national prosperity of Britain. The impact of Bell's barley variety Proctor, in adding 15 per cent to the yield of the crop, whose current value is about £150 million a year, was judged to be greater than that of any other scientific innovation considered, which presumably spanned all aspects of engineering.

Not all of the ARC's plant breeding has been equally successful, but the overall attainment has been good and certainly the work has been relevant and responsive to economic needs. So we can ask what will be the effect of changing the pattern of support and control. Because there are no adequate reserves of research capacity elsewhere in Britain, gross interference or experiment with state-supported plant breeding would hazard an economically important asset. Nevertheless those of us working in this sector are not opposed to change and we do believe that we can improve our ways of working and organization. Indeed a searching public discussion that would diagnose

present defects would be beneficial. This could lead to logical remedies in the form of a number of models of improved organizational arrangements. These would be compared and successively eliminated, like the models set up to explain any complex biological system, until the best fit was obtained. When only one model—like that of Lord Rothschild—is offered, in spite of the well-meaning efforts of the Dainton Committee, it inevitably becomes an Aunt Sally because there is no other target. So the illusion is created that the scientific community is opposed to change when it is reacting principally to the limitation on its freedom of choice.

Hobson's choice is offered by Lord Rothschild, so let us see what would be the effect of the application of his model on a successful and economically relevant research sector. The customers of ARC-supported plant breeding are the farmers who choose to grow our varieties, the crop processors and the community at large. Clearly, individual farmers are not able to sponsor research, which is why agricultural research has a different structure from that of any other industry. These customers, however, have always played a part in formulating our programmes by service on councils, committees and governing bodies and also in informal ways. Only the farmers can say whether the MAFF as a monopoly customer of ARC research could represent their interests adequately.

Now we can turn to the nitty-gritty of the Rothschild proposals and their application to a particular research field. Crop variety production involves long-term programmes that often last at least 10 years and that cannot be subdivided into short-term components. Moreover, success or failure is not apparent until the final stages, so plant breeding programmes would only be amenable to the open-ended type of contract against which customers are warned by Lord Rothschild. In addition, it is not possible to separate applied plant breeding from basic research, even following the Rothschild definitions. Thus, unless we discover the "rational correlations and principles" (para. 7), involved in the interactions of the genotypes of plant hosts and pathogenic organisms, we cannot

rationally breed disease-resistant varieties. The success of ARC plant breeding has derived from the intimate association of basic and applied research, and the part of the total programme that must be devoted to basic research is very much greater than would be provided by the 10 per cent surcharge. Without the back-up provided by this basic research, the techniques and methodology of applied research would not advance. All would then suffer because it is ultimately methodology and research competence, allied to scientific experience and judgment, that a customer of applied research would purchase.

The principal difficulty in attempting to operate a customer-contractor system, based very largely on short-term contracts, would be the inadequate opportunity offered for the forward planning of research facilities, especially when the contractor had no certainty of continued support. No commercial contractor could operate on this basis; his market research would have shown him the nature and scope of the market and he would equip to deal with it. Building a research and development organization in agriculture requires long-term planning of resources of land and buildings and of large scale capital facilities. Most important, long-term planning is necessary to provide a properly structured staff which can only come from appropriate recruitment and training policies.

One approach would be to ascertain the budget needed to sustain a stable research service of the necessary capacity, competence and flexibility. This budget could be agreed on a long-term basis, say of 10 years, and to it could be added funds from contracted research which should form not more than 20 per cent of the total income.

The stability of the research programme and the assured continuity of the research service so provided would allow us to retain and attract staff of high calibre who would be lost to an uncertain system committed entirely to short-term contracts. This is important because in plant breeding, as in all other research, the source of innovation is the individual worker and the research team. From this it follows that whereas it may be reasonable for the MAFF to have a voice in formulating research policy, unless a major share in determining programmes is left in the hands of the research workers involved, enterprise and originality will be driven from government research and development. The framework that might then exist would not be clothed in the fabric of creativity and imagination without which it would be a useless structure.