

## MORE CO-ORDINATED RESEARCH IS NECESSARY

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### 1 Concerning the CONCEPT of co-ordinated research, the following:

- (a) scientists know to-day that their research must be well organized and co-ordinated if it is to be successful and have practical impact. (The National Science Foundation of the USA and the Atomic Energy Commissions and Councils for Scientific and Industrial Research of various countries, including South Africa, are examples of organizations which successfully promote and co-ordinate scientific research both inside and outside of government). The concept of co-ordination seems particularly germane in the case of soil fertility research where the field is vast and geographically disperse, and where numerous branches of Government and organized agriculture are actively involved. In principle, (details are as yet not available), the recent initiation of a 'National Soil Fertility Project' in Australia commends itself to our attention;
- (b) looking at soil fertility research in the Republic to-day, one cannot but be perturbed at the duplication of effort and the lack of communication, at all levels, between those engaged in this field. The state of affairs is particularly unsatisfactory in that, although the Department of Agricultural Technical Services conducts more fertility research than any non-governmental agency and perhaps more than all non-governmental agencies put together, the influence of this research on fertilizer advisory services is not proportional to its extent and quality because the Department does not sell fertilizer. It takes little imagination to see the possibilities which lie in a co-ordinated research plan and the increased measure of dialogue and communication which might reasonably be expected to follow;
- (c) a large proportion of the research and practical experience which exists in the Republic to-day — and I believe that the amount is considerable — belongs to individuals and is not shared. Consequently, it is not being communicated effectively to the farming industry which has a right to it. What better way of drawing such individuals out and harnessing their experience and expertise than by making possible their participation in the planning of a co-ordinated research programme and the interpretation of the results of such a programme;
- (d) there is some frustration to be detected among research workers, particularly those of the younger generation who feel that they are doing a job of work but cannot clearly see what its importance is. We all need a reason for living and one sees, time and again, tremendous zeal develop in a man who becomes aware that he is part of something bigger than himself. It is my experience that there are relatively few 'loners' amongst us; on the contrary, there is a great deal of willingness to co-operate and work together. This refers, of course, to the

supra-structure — individuals *must* be given responsibility for individual jobs. It is also my experience that far greater personal satisfaction is to be had from co-operation than from individual effort. The latter is a very lonely and ultimately frustrating business when it is carried out in isolation;

- (e) co-ordination of soil fertility research is a practical possibility in this country at this time.

### 2 HOW necessary is more co-ordinated research?

As measured by the yardstick of its ability to produce a sufficiency of food and raw materials, South African agriculture is healthy. The need for more co-ordinated research is not 'urgent'. There is probably only one problem that falls into the 'urgent' category and that is the problem of containing soil losses by erosion — but that is another story for another day. The double productivity of our agricultural land over the next 25 to 30 years is a challenge rather than a problem. Planning and organization will be required to phase in the increased production as the demand arises. This should not be put off until the challenge becomes a crisis. We should not react only to crises.

### 3 HOW would research in soil fertility BEST be co-ordinated?

HOW would the results of such research BEST be communicated?

These are perhaps the most interesting questions. The second is as important as the first because there would be little point in more effective research if the efficiency of communication and extension did not at least keep pace. The answers to these questions should provide clear principles on which to plan a co-ordinated research programme and take it through to its logical conclusion.

As a soil scientist my reply to these questions can best be given by way of an example. A project currently under way in the Transvaal Region involves co-operation between the Soils Research Institute and research and extension personnel of the Region, and demonstrates the unifying or co-ordinating rôle of the soil which is the main point that I wish to make. Very briefly, detailed soil surveys are being made of all the research stations and of selected individual farms in the Region. Simultaneously, an extensive survey aimed at producing a map of the soil systems or zones at a scale of about 1:500 000 is being undertaken. The detailed key area surveys give accurate information about topographic and geological relationships of the soils of each zone. Significant data on each major soil type (series) is being or will be summarized and catalogued under the heading of that soil. This is being done in co-operation with Regional personnel. Thus we envisage establishing a data bank with an account for each important soil. The Extension Officer who, as things go, must and does provide advice on land capability, management and cultural practices including fertilization, will be able to draw on this bank. The important point here is that the soil plays the co-ordinating rôle — it is

the basis on which information is classified. In the past, the agro-ecological regions have provided this basis but they have proved to be too coarse in that very large soil differences occur within them.

The question may now be asked —

how will it be possible to apply information available for a certain soil to similar soils elsewhere (under similar climatic conditions) if sufficiently detailed soil maps are not available to guide the Extension Officer? He must, of course, know the account number if he wants to draw on the bank. The 1:500 000 map will not tell him the account number but it will certainly narrow down the field of possibilities. This brings me to the classification system, about which the following statement.

A soil classification system that is indigenous to this country is being developed. It is being developed on the basis of our soils and not on the basis of the soils of any other country. It differs in important respects from all other classification systems including those that may have been used in this country. It should be judged entirely on its own merits. Practical reality and practical application by non-specialists have been important considerations because if the system cannot be applied then it is useless to us. It has not been made public yet because this is a very dangerous thing to do in the formative stages of any classification. It has been developed on the basis of information gathered in the Tugela Basin and elsewhere in the Republic wherever soils surveys have been conducted during the past ten years. That part which is relevant for the Tugela Basin will be published shortly. An expanded version (in draft) to meet national requirements will be thrown open to criticism and comment during the latter half of this year and reappraised before the first definitive edition is published in 1970. This will be the end of the beginning and we anticipate refinement and expansion rather than major changes from thenceforth.

It must be emphasised that the classification system is a means to an end, or to many ends, and not an end in itself. It is a way of thinking and provides a logical approach to certain problems rather than a solution to them. It is a means of organizing information and a vehicle for transmitting information. I would prefer the classification system and its practical application to be viewed, initially, with reserve and even suspicion but, at the same time, I would demand that it be given an honest and fair trial.

Much harm can come to the system if rash claims are made in its name and I ask for a clear

and balanced understanding of the meaning, the possibilities, and also the limitations of soil classification.

To return to the questions in hand, I suggest, for consideration and discussion, that if a co-ordinated soil fertility research programme were to be planned it would be necessary, firstly, to review existing information. This, as far as I can see, can only be done with reasonable accuracy on the basis of the soil. It cannot be done on the basis of geographic regions, or agro-ecological regions, or climatic regions, or regions demarcated by any other natural feature except where the soil is uniform within such regions. Secondly, planning will involve assignment of priorities. An inventory of our major arable soils and existing information on them will be necessary for this. Thirdly, the precise location of field trials would require selection of sites representative of soils for which priority information is required. And finally, should a data bank be established for storing the information gained from such a research programme (and this information would include yield correlations, soil test calibrations for use in advisory work etc), then the logical way of classifying this information prior to storage, and the logical way of drawing on the bank would be according to the soil type to which the information applies, with a qualifier for climate.

A committee of the American Association for the Advancement of Science has recently reported on the effect of military, political and commercial pressures on scientific research in the USA. The main finding was that the normal processes of science, namely disciplined experimentation with the inclusion of controls, free disclosure of results, general dissemination of findings and widespread verification and criticisms of results, interpretations and conclusions, are being violated.

A number of examples involving nuclear testing, space research, insecticide and pesticide use and premature commercial exploitation of synthetic detergents were quoted to show how military and commercial pressures and secrecy, and government and other "support for science on the basis of immediate demands for particular results", have resulted in costly mistakes, some of which may have endangered human welfare. We are not involved with dramatic events such as nuclear explosions and moon landings but we are involved with the process of science which gets at the truth by continuous self-examination. For this, vigorous open discourse and criticism are essential. A degree of co-ordination that will foster communication and encourage greater discourse without regimenting and making our research stereotyped would be a welcome development.