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CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
TECHNICAL ADVISORY COMMITTEE

REPORT OF THE MEETING OF THE
TAC STEERING GROUP ON WATER MANAGEMENT RESEARCH AND TRAINING
(FAO Headquarters, Rome - 15-16 October 1981)

TAC SECRETARIAT
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, November 1981

TABLE OF CONTENTS

	<u>Page</u>
Opening of the Meeting	1
Adoption of the Agenda	1
General Progress Report by Study Team Leader	1
Report on the International Expert Consultation on Farm Water Management - Islamabad-Lahore (Pakistan)	4
Review of the Information Base, of the Priorities and Focus of an International Initiative	5
Alternative Courses of Action - and Their Related Institutional Models - for CGIAR Support	9
Programme of the Study Team	12
Conclusions and Recommendations	14

ANNEXES

TAC Steering Group on Water Management Research and Training - and - TAC Study Team on Water Management..	Annex I
Index of Documentation for TAC Study Team on Water Management	Annex II
Agenda	Annex III
Extracts from the Report on International Expert Consultation on Farm Water Management	Annex IV
Terms of Reference of TAC Study Team on Water Management Research and Training	Annex V

MEETING OF THE TAC STEERING GROUP ON WATER MANAGEMENT RESEARCH AND TRAINING
(15-16 October 1981, FAO, Rome)

REPORT OF THE MEETING

1. Further to the ad hoc Meeting on Water Management ^{1/}, held in Washington on 20 July 1981 under the auspices of the Consultative Group on International Agricultural Research (CGIAR), the Technical Advisory Committee (TAC) of the CGIAR assembled a Study Team of four consultants on Water Management Research and Training and convened in Rome, FAO Headquarters, on 15-16 October 1981, a meeting of a Steering Group for the guidance of these consultants.

2. Dr. W. Treitz was in the chair. The meeting was attended by all members of the Steering Group, the consultants of the Study Team, two observers from FAO and two members of the TAC Secretariat. A list of participants is attached as Annex I.

Opening of the Meeting - (Agenda Item 1)

3. The Chairman opened the meeting of the TAC Steering Group with the Study Team welcoming the participants and introducing the four consultants of the Study Team. He then requested the TAC Secretariat to present a brief run down of the relevant documentation made available to the Study Team as a basis for its deliberations and preparatory work for its mission. A list of the documentation is attached as Annex II.

Adoption of the Agenda - (Agenda Item 2)

4. The Chairman invited comments and amendments to the proposed Agenda. As no amendments were proposed, the Agenda was adopted (attached as Annex III).

General Progress Report by the Study Team Leader - (Agenda Item 3)

5. Dr. F.E. Schulze, leader of the Study Team, reported that most of the work of the Team, since its arrival in Rome, had concentrated on a review of the existing documentation and discussions among themselves and with the

^{1/} CGIAR Secretariat, 15 September 1981, "Minutes of the ad hoc Meeting on Water Management" (ICW/81/17), World Bank, Washington D.C.

Chairman and Secretariat of TAC. The Team had met for one day with Sir Charles Pereira, leader of an IDRC Consultant Team which had produced a report on this subject 1/, with Drs. Horning and Dieleman of FAO on the FAO International Support Programme on Water Management, Dr. Caponera, Chief of the Water Legislation Branch and Prof. M. Benedini of the Water Research Institute of Rome. Some preliminary notes had been prepared by the Team for the meeting of the Steering Group and a tentative travel programme was outlined.

6. After reviewing the available documentation, the Study Team had come to some preliminary conclusions that: (a) there was general agreement for a stronger support for a greater CGIAR effort in water management, but (b) that such effort should be of modest scale as there was reluctance with respect to the creation of a new centre similar to the existing IARCs, (c) that the effort should (most likely) be concentrated on integrated management and operation of irrigation systems with a multi-disciplinary and holistic approach. The functional tasks to be covered by this effort, and the institutional mechanism for its implementation, however were not so clear. Dr. Schulze, therefore, proposed a framework for the discussion in the form of a matrix reflecting different approaches or emphases, namely the whole system vs. the component approach, the water delivery sub-systems, the water users sub-system (the farmer); the design, operation and management of the irrigation system; the irrigated farming systems. For each of these different approaches a series of functional tasks could be considered, i.e. research; training; dissemination of knowledge; advisory services. The combinations in the proposed matrix were numerous. Obviously an international effort would require an appropriate mix of these different approaches and functional tasks, but it was hoped that the proposed matrix would help in the discussion of the scope, focus and priorities of the proposed international effort (Agenda Item 5) and of the alternative mechanisms to be proposed to this effect (Agenda Item 6).

1/ "Opportunities for Increase of World Food Production from the Irrigated Lands of Developing Countries", Report to TAC by Sir Charles Pereira, Drs. A. Aboukhaled, A Felleke, D. Hillel, A.A. Moursi, IDRC, Ottawa, April 1979.

Matrix for Priority Analysis ^{1/}

Functional Tasks Approaches	Research	Training	Compilation and Dissemination of Information	Advisory Services
System Components				
Delivery Sub-System				
Users Sub-System				
Whole System				

^{1/} The main issues to be discussed in each case would then be the emphasis (where?), the framework (how?), and the work programme (what?).

7. There was a general agreement among the members of the Steering Group on the usefulness of the proposed matrix as a framework for the discussion. Some participants stressed, however, that there was not yet a full consensus among the CGIAR members on the need for a new international effort in this field as compared with the requirements for action at national and regional level. Moreover, it was not yet certain that an international effort, if required, would have to be implemented through the CGIAR and would necessarily involve the creation of a new institution. In fact some CGIAR members had underlined the role which some of the existing institutions, the IARCs in particular, are playing already and/or could play in this area. Nevertheless both national and international action should be promoted concurrently in this field and should be mutually supportive.

Report on the International Expert Consultation on Farm Water Management
- Islamabad-Lahore (Pakistan), 27 September-5 October 1981) - (Agenda Item 4)

8. Dr. P.J. Dieleman, as Secretary of the Consultation on behalf of FAO, explained that the meeting had been called to give the opportunity to 16 participants from 13 countries of Asia and Africa, and some 20 foreign observers to learn from the pioneering work done in Pakistan in water management. The purpose of the Consultation was to examine the lessons which had been learned from this experience and identify what could be used elsewhere. The main topics of the meeting were the improvement of irrigation systems; the farmer participation and organization; the institutional arrangements at Government level; training and research. A preliminary report on the findings, conclusions and recommendations of the Consultation was briefly presented by Dr. Dieleman (see full text in Annex IV).
9. Dr. Amir Muhammed, who had co-organized the Consultation and chaired part of it, then reported on the immediate impact which the meeting had in Pakistan. Thanking FAO, UNDP and USAID, Dr. Muhammed stressed that this Consultation had increased the awareness of the importance of farm water management at Government level, and highlighted the growing concerns on the present misuse of irrigation water and irrigation systems in the country. The Ministries of Agriculture and Water and Power and specialists of different disciplines concerned, had now a clearer and common understanding of the considerable gaps in knowledge and experience which existed, in particular in the socio-economic field, and of the need for a much closer cooperation to remedy this situation. New concepts had been developed such as the ratio of grain output per unit of water used, and the irreplaceable value of the irrigation water inputs as compared to others which can be manufactured locally or imported. The key role of water management at different levels in small and large-scale irrigation systems, but also in rainfed areas had also been stressed. The Consultation had generated a growing interest of the Government for further action in water management both at national and international levels.
10. As to the foreign participants in the Consultation, they had been impressed by the multidisciplinary work carried out in the Mona Project as a possible model which could be adapted to similar situations in their countries. They had returned to their countries with additional knowledge and experience on ways to improve water management by using smaller units, low cost technologies, the use of local manpower and other resources, the involvement of the farmer in all stages of planning, design and construction through water users associations as means to ensure their active interest in the maintenance and operation of the system. The need to expand training at all levels through improved curricula in water management at educational institutions, and through additional courses, was also underlined. The

importance of the institutional linkages and adjustments in the management of irrigation systems had also been clearly demonstrated. A similar Consultation was planned by FAO in the Philippines to examine other situations and problems.

Review of the Information Base, of the Priorities
and Focus of an International Initiative - (Agenda Item 5)

11. Dr. M. Dagg, member of the Study Team, presented a series of general considerations having a bearing on the identification of priorities. Broad agreement had been reached among the Study Team members on priorities (if not in detail) and guidance from the Steering Group was sought as to concurrence on the general conclusions reached so far, as presented below.

12. While many factors in water management influence the productivity of an irrigation development scheme, the biggest multiplication effect comes when the farmer is convinced that the water supply is reliable enough for him to risk high levels of inputs. Thus the criterion for "best" planning and operation in all phases of the system, and the main focus of an international research initiative in irrigation water management, should be the reliable and safe delivery of water at the farmer's field. Different proposals had indicated various ways of reaching this objective: to improve the delivery channels 1/; to assess better the water requirements for the crop and for minimizing salinity problems 2/; to improve the capacity to diagnose key deficiencies in the system 3/; to ensure the delivery of the right amount of water in the root zone of the crops through appropriate management both upstream and downstream 4/. Most of these proposals stressed the importance of addressing problems in the noman's land between engineering and agricultural disciplines, and between them and social organization aspects. Research on the operations that fill in those gaps in disciplinary cover had been grossly neglected. Many disciplines were involved in a complicated way with water delivery, but each had tended to preserve its own criteria, goals and value systems in considering their own components of the system: it was very necessary to develop by an inter-disciplinary approach, a common set of values related to the benefit of the whole system.

13. An interdisciplinary approach, Dr. Dagg said, was easier to achieve through an international programme than at national level although in the long-run the ultimate objective was to establish this interdisciplinary approach at local level. It was also easier for a closely directed

1/ Mostly in the Trilateral Commission Report.

2/ Mostly in the Pereira Report.

3/ Mostly in Ford Foundation Proposals.

4/ Mostly in the TAC Proposals.

international interdisciplinary team to maintain a sharp focus, make rapid progress, and serve as a model for similar efforts at national levels. In the opinion of Dr. Dagg, experience had already shown that the CGIAR system had the capacity and the comparative advantage to promote the kind of international action that is required in this field. The applied and technological research to be carried out on existing large irrigation schemes would aim at deriving generalizable principles and guidelines for management of water and people, and at developing new methodologies for diagnostic, evaluative and monitoring activities. These innovations would be valuable in preparing training courses at the extension and development level envisaged in the FAO Irrigation Support Programme (ISP) and the Study Team agreed that the proposed international research initiative and the FAO-ISP are well noted and complementary in leading to the development of national proficiency in this field.

14. Other members of the Study Team added to Dr. Dagg's presentation, stressing that reliability of water supply was not the major problem in some countries and could not, therefore, be seen as the overall priority. Other problems (salinity, flooding) were sometimes more important. Moreover, while interdisciplinarity was easier to achieve at international level, the attainment of closer cooperation among various disciplines and institutions at national level was a sine qua non imperative for improved water management in the real life conditions of the irrigation projects. While there was a wide agreement on the magnitude of the impact on production which could be derived from improved water management, the perception of the priorities also depended not only on the disciplines involved but also on the comparative advantages of an international initiative in helping to realize this potential. These advantages were in assembling a wide range of competence and talents at the highest level of expertise from a large number of different countries; in developing and disseminating methods to identify and solve problems; and in raising the professional interest and status of work in these fields in the cooperating countries. Three potential areas were suggested where such comparative advantages could be best realized:

- (i) methods for appraising canal irrigation systems to identify the most feasible and cost-effective improvements;
- (ii) the distribution of water on the main systems as a subject for research, training and professional decision making;
- (iii) management science and staff management ("management" referred here not to the management of the water resource but to the management of information and people).

15. In the ensuing discussion, several members of the Steering Group discussed the rationale for an international initiative in this field. It was first essential to recognize that the problems to be addressed were not necessarily the same in Asia, Africa and Latin America. The related information base, the body of knowledge and experience available in different countries and regions were also different. In determining the need for an international research effort in water management some members felt that one should first examine (a) whether the present knowledge gaps and lack of experience are the major constraints or whether the dissemination of the knowledge and experience already available could produce the desired impact, and (b) whether the additional knowledge and experience to be gained from research referred to problems common to a large number of countries and were easily transferable and applicable to diverse conditions (or were specific to the location considered): the economies of scale in gathering this additional knowledge and experience through an international programme would have to be carefully assessed and compared with the impact which could be obtained more directly from a series of activities at national level. In the opinion of a participant, water did not lend itself to the same kind of treatment in international research activities as seed or other inputs which were relatively free of price relationships considerations and possibilities of appropriation on the results of the research. The Study Team would, therefore, have to present convincing arguments in favour of an international action by clearly demonstrating that it would generate new knowledge and experience which can really help people facing practical problems at local level. Some members argued further that the limited impact which the available experience had so far in some countries was not due to its inadequacy but to the slow process by which new knowledge and technology are being put to use in developing countries.

16. Many other participants, however, argued in favour of an international initiative by stressing that the present information base in water management was scattered and mostly confined to the expertise of some foreign consultants or local managers of irrigation systems. There was a need to assemble the diverse experiences available and to draw from these some general principles and methodologies which could serve as a basis for training and further research and testing. The diversity of the local situations had also been a problem for existing IARCs and this had been overcome by a close cooperation of national and international agricultural research. In many developing countries, however, the lack of political will, the limited resources available, the multiple constraints of national bureaucracies on diverse professional categories, the institutional and political barriers would make it difficult to launch the kind of collective, sharply focussed effort in water management, which was needed and which characterized so far international agricultural research.

National efforts should be accelerated by such an international initiative but, conversely, an international initiative would not be viable without a close link with real life situations at national level. The emphasis put by the FAO Committee on Agriculture and FAO Conference on the need for action at national level was underlined in this context. Nevertheless, several alternatives for international action would have to be examined, which may or may not involve the CGIAR.

17. Turning to the question of priorities, the members of the Steering Group generally agreed that an international effort on water management should consider the whole irrigation system rather than selected components. System components would be examined in so far as they relate to the whole system and play a critical role in its management. To this end, research would concentrate on the methodologies for diagnosing inefficiencies and identifying the key components which require improvements. System thinking and system analysis were, therefore, expected to play an important role in the research approaches to be developed and in promoting interdisciplinary work. These could help in identifying the objectives of the system considered, analyzing its sub-systems, its environment, the resources of the system, their management and the inter-relationships and interactions at play. This system approach would be particularly suitable in developing methodologies for problem diagnosis and problem solving, an activity which many participants considered as the main priority for an international effort. Other priority areas suggested by the Study Team (main delivery systems, management, monitoring, ...) would be necessarily addressed as part of the system analysis for a comprehensive appraisal and improvement of irrigation systems.

18. In following this system approach, however, some speakers stressed that it would be essential to start with an inventory of available information and promote its dissemination, possibly through existing mechanisms such as ICID, AGRIS, etc. (rather than through a CGIAR-sponsored data base). In this context, a member of the Steering Group recalled that his country would favour a two-tier approach including an international effort for documentation and information exchange and a "federation" of existing institutions cooperating in several common research and training endeavours. Others indicated that collection and exchange of information and documentation in this field could not be a substitute for the international action required, but would be a subsidiary function as a support service to the international research and training activities in following the same pattern as that of the IARCs.

19. While there was a wide agreement on the need to examine the whole irrigation system, several members did not exclude the possibility of addressing some component research at international level through some kind of cooperative networks, such as those supported by the IARCs or those promoted by UNDP (TCDC), FAO, etc. Flexibility was recommended in this respect but it was essential that, as indicated by the recent Review of the CGIAR, networks be supported by a strong resource base. Some participants, however, queried the need for an involvement in component research arguing that investigations of physical, chemical, biological aspects would require different kinds of research facilities and staff, and imply important capital requirements. It was noted, however, that these capital requirements could be significantly reduced if the networks were using facilities in existing institutions by some kind of sub-contracts or cooperative arrangements.

Alternative Courses of Action - and Their Related
Institutional Models - for CGIAR Support - (Agenda Item 6)

20. Dr. Schulze outlined diverse possible mechanisms by which the international activities discussed above could be implemented, namely through an institutional base (e.g. an IARC); through networks or through projects of limited scope and duration or through a mix of these different mechanisms. Reference was made in this respect to the existing Centres which operate both networks and projects with core and non-core funds.

21. The Steering Group agreed that diverse alternatives should be examined by the Study Team. It was important to keep in mind, however, that the CGIAR members were not likely to support an initiative following the model of the major IARCs with large capital investment. An order of magnitude of \$ 3-5 million per year had been suggested previously for the operating budget, but the Steering Group felt that this should be considered with some flexibility in relation with the actual needs, the required impact, and the costs involved on the long run. Certain types of research and training activities, however, seemed to be ruled out as they would require major investments, unless facilities of existing institutions could be used.

22. Dr. Schulze then referring to the matrix presented under agenda item 3, suggested that the discussion of the Steering Group should focus on the nature and contents of a proposed international programme which could meet the following requirements: (a) a joint effort of national and international activities, (b) an interdisciplinary approach, (c) relatively limited capital expenditures. The international programme could be envisaged in the form of a small centre for training and research in which

interdisciplinary aspects are investigated and taught. The international staff should be ready to work with people of different experience, from different disciplines, different universities, different institutions. The training and research programmes would have to be developed by the international staff since no model exists as yet on the kind of curricula and agenda of research topics to be addressed with the proposed interdisciplinary approach and system analysis methods outlined above. The following sequence of action was suggested:

- (i) the first step would be to assemble and compile the information base, mainly through desk studies drawing from many information sources, including the inventory of institutions having expertise in this field and able to contribute. This first survey phase should also collect information on existing field experiences which have not yet been written up and assess what is available from management sciences which could be used in this programme;
- (ii) out of these desk studies the research programmes, the training curricula, and the operational procedures would be determined, including the criteria for the selection of the sites for future field studies;
- (iii) then work would be pursued at selected sites in specific regions (i.e. command areas), making case studies, developing and testing methodologies for diagnosis, problem identification, problem solving and monitoring.

A member of the Study Team outlined what could be the programme for the first year, namely (a) R&D work in methods of appraisal and management sciences, (b) reconnaissance in various countries, (c) the building up of a repertoire of promising methods and interventions, (d) comparative analyses to be presented to a series of workshops on some key subjects 1/.

23. The Study Team was invited to study further the relative importance of the international training, information, research functions to be performed. These functions could be performed through different implementation mechanisms (a centre or some other machinery) and for funding (the CGIAR or other sources of funds). A minimum of information activities would be necessary as support to the research and training programmes. A participant, however, wondered whether the effort required in developing the information base and the training curricula would be a continuing

1/ i.e. alternatives in scheduling and distributing water on the main systems; handover of water from staff to farmers; application of management science to canal irrigation; approaches and methods for rapid appraisal, diagnosis and monitoring.

activity or a one-time international effort which then would be pursued by existing institutions at national and regional level.

24. In further discussion on the proposed alternatives suggested in the terms of reference,^{1/} several members questioned the need for the Study Team to examine the possibilities of non-CGIAR involvement as an alternative. Others felt that the pros and cons of "no-CGIAR involvement" (but including further encouragement and guidance for international support) should be discussed. Discussion of the pros and cons of other alternatives suggested would also be required, as it was premature to discard some alternatives at this stage. Moreover, the Study Team should be free to come up with other alternatives if felt necessary. A number of speakers indicated that they were in favour of some kind of hybrid solution between an institute (terms of reference 3(b)) and a service (terms of reference 3(c)). There were, however, potential problems in the development of an international service in that it could get unduly involved in consultant services, technical assistance and operation of specific irrigation systems. It was recommended that the Study Team should also give in its report the pros and cons of diverse priorities and the reasons for their recommendations in selecting some and reject others.

25. Several members of the Steering Group stressed that it was essential that those involved in developing concepts and methodologies in irrigation water management should gain direct experience in testing those concepts and methods in the field, in cooperation with the countries concerned. A minimum of participation in the actual implementation in real life conditions was essential for this international staff. It was suggested that the international research group should be assembled at a location where there is a wide range of irrigation activities, available experience and facilities, and ongoing programmes in agricultural education and training (i.e. existing university or training centre). They should also have an opportunity to learn to work together as a research group at some particular locations and build up their experience in interdisciplinary work. Then, and only then, teams of trainees could be brought in to share and discuss their experience.

26. The training curricula would be aimed at upgrading the professional competence of people who are already working in this field (post-graduate in-service training, refresher courses). Training periods would, therefore, be relatively short and involve mostly in-service training. Some members of the international staff could work in interdisciplinary teams for limited periods and in parallel in different continents. But before spreading activities, it would be essential to establish a critical mass of expertise in this type of work, concentrating on one site for a sufficiently long period. It would be essential for the international

^{1/} See Annex V.

research group to gain respect from the countries by demonstrating at an early stage what they can achieve in working with nationals on a few specific cases, thus showing the usefulness of their interdisciplinary approach to other countries, in which they may then be asked to move in a second phase. The international group would first have to practise what they would be preaching later on. Reference was made in this context to the French experience in multidisciplinary training as practised by the Ecole Nationale du Génie Rural et des Forêts involving a horizontal integration of disciplines at project level. The vertical integration from the government agencies down to the farmer was, however, crucial and more difficult to achieve. Caution was expressed, however, about the risk of too deep an involvement of the international research group in the management of specific irrigation projects at an early stage. At the same time, lasting effects could not be expected from a limited effort of a fixed-term duration in one region, as exemplified at present in some bilateral projects. Continuing linkages with selected irrigation command areas would have to be maintained.

27. It was also suggested that the Team should examine the extent to which FAO could carry out the functions listed above, what programme FAO was presently implementing and how it had organized itself for this purpose 1/. It was mentioned that FAO had the necessary multidisciplinary expertise and information base but had been limited by the lack of appropriate financial resources to undertake action at the required scale. There were often some limitations in the duration of the standard UNDP-funded projects it operated, but this did not necessarily apply to its Regular Programme activities. It was also suggested that other alternatives could be considered involving the World Bank and/or the Regional Banks. Reference was made to the mechanism established by IADB in convening a liaison/coordination committee among heads of national programmes, which identified specific research and training requirements and allocate the tasks among the cooperating agencies. The Study Team was invited to examine this particular experience as a possible model of international service.

Programme of the Study Team - (Agenda Item 7)

28. Dr. Schulze presented the programme proposals of the Study Team. This programme had been elaborated taking into account the availability of the individual members of the Study Team and the deadline set for

1/ i.e. its International Support Programme for Farm Water Management.

submission of their report to the 27th TAC meeting (9-16 March 1982, IRRI, Philippines).

29. After two weeks in Rome for briefing and discussion, the Study Team proposed to visit jointly during the month of November, Pakistan and India and then the Philippines where they would draft the preliminary outline of their report which would be distributed for advance information to the Steering Group and TAC. After some individual visits in December to selected institutions in Europe, (ODA, ICID, CEFIGRE ...) the Team would reassemble in Washington in January 1982 for further discussion with staff members concerned at the World Bank, IADB, USAID and have a second meeting with the Steering Group at which their final conclusions would be presented and discussed. The Team then proposed to finalize their report, partly in Washington and partly in Rome.

30. The Steering Group had a wide-ranging discussion on the proposed travel programme. It was understood that the main purpose of these travels was not to study further the problems and gather additional technical information, nor to select the site(s) of the future activities and ascertain the practical arrangements for their implementation. The visit to selected countries would be aimed at discussing the practical feasibility of the programme and alternative institutional models. The main objective would be to assess the interest and support of those who live with the day-to-day problems of irrigation water management in the field and in the government institutions, for some form of an international programme as outlined by the Steering Group and the Study Team. Moreover the Study Team was not expected to assess in detail or negotiate with international institutions or bilateral assistance agencies, the possibilities of implementing the proposed water management research and training programmes through one of these institutions and agencies.

31. While noting the importance of the irrigated areas and population concerned in Asia, the Steering Group recommended that a more balanced coverage of irrigation problems in the developing world should be ensured in the travel programme of the Study Team, including visits to selected places in Africa and Latin America. The deadline for submission of the report of the Study Team to the 27th TAC meeting was also queried: some participants felt that the Study Team should take as much time as necessary to present definitive conclusions since this topic had been on the agenda of TAC and CGIAR for almost ten years. At the same time, it was essential not to lose the present momentum and interest by further delays. It was noted that if, as might be expected, the CGIAR would meet in May 1982, a submission of a proposal by TAC to the CGIAR would be examined with more attention at this meeting, rather than at the Centres Week where the agenda of the Group is usually very heavy.

32. In the light of the above, the Study Team submitted a revised travel schedule with a shorter programme of visits to Pakistan, India and the Philippines, and additional visits to the Sudan, some other countries in West Africa (to be determined) and Latin America (probably Mexico). This revised programme was approved including a postponement of the meeting of the Steering Group to 11-12 February 1982. The deadline for submission of the report of the Study Team was set for 20 February 1982.

Conclusions and Recommendations

33. The Steering Group confirmed the terms of reference and approved the programme of the Study Team as amended in the course of the discussion to include visits to Asia, Africa and Latin America.

34. The Steering Group supported the interdisciplinary approach which the Study Team proposed in identifying the priorities and focus of a possible international initiative in the field of water management research and training and agreed on the need to examine the irrigation system as a whole. The Study Team was also requested to give particular attention to:

- (i) those key components in the system which do not receive sufficient attention by the diverse professional categories and disciplines concerned in irrigation water management;
- (ii) the identification of existing deficiencies and gaps in the compilation and dissemination of information, as well as in the provision of recurrent and sustained services for irrigation system management;
- (iii) the analysis of the comparative advantages and complementarity of international and national activities in this field;
- (iv) the needs and possibilities of small farmers, including their participation in the planning, implementation and management aspects of irrigation systems.

35. The Steering Group confirmed the request made to the Study Team to examine freely (as deemed appropriate and necessary) the pros and cons of diverse alternatives among those indicated in paras. 3-a) to 3-e) of its terms of reference 1/, while taking into account the following two points:

- (i) a majority of members of the Steering Group is inclined towards an option which would include elements of alternative 3-b (an international centre) and alternative 3-c (an international service);

1/ See Annex V.

- (ii) if financial support by CGIAR is recommended, it is likely to be limited and therefore the demands should be relatively modest. Whereas an operating budget of 3 to 5 million US dollars per year had been suggested at the 20 July 1981 meeting in Washington, the Steering Group recommended that this should not be considered by the Study Team as a pre-established and fixed ceiling but as an indication of an order of magnitude to be used with flexibility in a conservative but realistic appraisal of actual requirements for diverse alternatives.

36. The Steering Group agreed to meet again in Rome on 11-12 February 1982, to consider the final draft of the report of the Study Team.

37. The Steering Group expressed full satisfaction for the work carried out by the Study Team so far. While referring to the Study Team the observations and suggestions made in the course of the meeting as recorded in this report, the Steering Group expressed full confidence in the successful completion of their task.

TAC STEERING GROUP ON WATER MANAGEMENT RESEARCH AND
TRAINING

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Index of Documentation for TAC Study on Water Management

1. Documentation sent in advance to Study Team Members

Terms of Reference

Briefing Notes for the TAC Study Team on Water Management

A brochure entitled: "Consultative Group on International Agricultural Research" describing the CGIAR objectives, how the Group works, and indicating briefly the activities of the 13 International Agricultural Research Centres (IARCs) which operate under the auspices of the Group.

Statement by the Technical Advisory Committee on its Role in the CGIAR system; statement prepared and approved by TAC at its 26th meeting, 23-30 June 1981, Ibadan, Nigeria.

Comments from IARCs on their Water Management activities and on TAC's proposal for the creation of an International Institute for Research and Training on Irrigation Water Management

Comments from CGIAR members and other interested parties on TAC's Water Management proposal and related activities.

Opportunities for Increase of World Food Production from the Irrigated Lands of Developing Countries; a report to TAC of an IDRC sponsored mission led by Sir Charles Pereira which indicates the nature and location of soil and water management problems, the kinds of research and training needed to alleviate these problems, as well as the organization required to implement the necessary research and training programme.

Survey of Irrigation in Eight Asian Nations, by W.R. Gasser of USDA; this paper provides information on irrigation in India, Pakistan, Indonesia Thailand, Bangladesh, South Korea, Philippines and Sri Lanka.

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Comparative Study of the Management and Organization of Irrigation Projects, World Bank Staff Working Paper No. 458, May 1981. Prepared by: Anthony F. Bottrall, Consultant, Agriculture & Rural Development Department.

The List of Participants, the papers presented at the International Expert Consultation on Farm Water Management, its Findings, Conclusions and Recommendations, Islamabad - Lahore, Pakistan, 27 September - 5 October 1981.

STEERING GROUP MEETING ON WATER MANAGEMENT

15-16 October 1981

FAO, Rome

Room F-105, 9.00 a.m.

Agenda

1. Opening by the Chairman of the Meeting, Dr. W. Treitz
2. Adoption of the Agenda
3. General progress report by the Study Team leader, Dr. F.E. Schulze
4. Report on the Water Management Seminar held in Pakistan (27 September - 5 October 1981)
5. Review of the information base, of the priorities and focus of an international initiative
6. Alternative courses of action - and their related institutional models - for CGIAR support
7. Programme of the Study Team
8. Recommendations of the Steering Group
9. Other business
10. Date and place of next meeting, if any.

Extracts from the Report ^{1/} onInternational Expert Consultation on Farm Water Management

(Islamabad-Lahore, Pakistan, 27 September-5 October 1981)

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

1. FindingsISSUES

The papers and discussions on the subject of farm water management were grouped into the following categories:

- irrigation system improvement, which concentrated on Pakistan's experience in reducing water losses by the improvement of water-courses, turnouts and similar simple structures. Additional topics included drainage at the farm level, precision land levelling and other irrigation practices, control of waterlogging and salinity, desirable sizes of watercourse command areas and problems related to tubewell supplies.
- farmers participation and organization, including the need to mobilize the farmers, the farmers' role in the various phases of improvement projects, the organization of farmers in water users' associations in order to facilitate participation, the functioning of these associations, and "bottom-up" approaches.
- institutional arrangements at government level, which related to the need to establish irrigation extension services and their links with other input-providing services, the responsibilities of ministries of agriculture on the one hand, and of ministries of water resources or irrigation on the other, desirable sizes of water users' groups, the integration of main and farm-irrigation operations, and the establishment of research and training facilities.
- training and research, particularly the type of training needed and for whom, the need to introduce farm-water-management instruction modules into the regular curricula of universities, colleges and vocational training institutions, the need for and type of international support to research and training.

Converging concepts and approaches

The papers and the discussions both emphasized conceptual aspects rather than specific details. It was felt that concepts can be the more easily transferred between and within countries. Farm-water-management problems require

^{1/} These extracts are taken from the unedited version of the report which is being processed and will be published shortly by FAO.

an interdisciplinary approach, with a balanced mix of technical, social, economic and institutional components. The mix is, however, specific for each country or project area; approaches that are successful in one country may not be applicable in another. Most foreign and Pakistani participants found, somewhat in their surprise, that such key expressions as "farmers' mobilization and participation", "irrigation extension services", "water management curricula in educational programmes", "training at all levels", "use of low-cost technology", "maximum use of local manpower and other resources", which were the jargon of a few not so long ago, were routinely used by all during the meeting. Indeed, it appears that of late, it has become widely recognized that farm water management is more than just a technical issue. To make technical improvements of the irrigation system work, the farming community as a whole and the farmers individually must be addressed and involved. They all have to be encouraged to participate as fully as possible. To that end their socio-economic condition and institutional environment need to be surveyed. There is also a need to examine the government bureaucracy to see how more effective leadership could be achieved. These and various related issues have been extensively discussed during the meetings along with those on improvement of the physical system.

Exchange and dissemination needs

Many participants appeared to be poorly informed on water management work done in other countries and found results obtained in these of interest to them. Obviously there is a considerable need to make these more widely known and to promote exchange of information and experience. It was commonly felt that this would substantially contribute to furthering the cause of farm water management and support programmes in many countries.

Role of international organizations

Several participants called on international organizations such as FAO to help achieve the required exchange of views and dissemination of work done worldwide, and - in general - to promote communication between administrators and specialists dealing with farm water management. Some felt that these organizations should also provide more assistance in the development of training programmes and materialize in promoting cooperation between developing countries and in helping to initiate farm water management programmes in them.

Research support

The need of international support for research and training was the subject of extensive discussion. All participants agreed that such support was essential to the success of the programmes in their countries. It was also agreed that this would require the operation of an international facility. Regarding the shape of such a facility, some participants expressed a preference for a CGIAR-funded institute similar to CIMMYT and IRRI. Others, however, considered that the country and site specific nature of the constraint would render such an institute rather ineffective in helping to overcome constraint at the national level and in strengthening the national capacity to deal with these. These participants opted for an international effort geared to direct support to the national programmes.

2. Conclusions and recommendations

2.1. General Conclusions and Recommendations

Experience reported by Pakistan and other countries, shows that for the successful improvement of farm water management in both large-scale irrigation schemes and small-scale or communal systems, the following key elements should be included:

1. The active participation of the farmers in all phases of planning, implementation, operation and maintenance.
2. The establishment of water users' associations, which are instrumental in the dialogue among government agencies, and farmers, in negotiating main system delivery schedules in deciding on the community supply schemes, in the distribution of water in the "tertiary" facilities, and in the channelling of services to the farmers.
3. The provision of simple, low-cost technology and facilities which are easy to handle, adapted to the local conditions and resources, and which can be produced at the village or district level to the maximum possible extent.
4. The provision of inputs and services which the farmers need to make a good use of new facilities to increase agricultural production. This includes guidance and training in the pre-project phase, during the project period, and after the project has been completed, provision of credit and such supplies as seeds, fertilizers, pesticides.
5. The training of agricultural and engineering professionals, sub-professionals, technical assistants and farmers in farm water management through courses and special programmes in Universities and Vocational Institutes and through study tours and fellowships.

6. The establishment or strengthening of irrigation management and extension services at the government level to programme and guide water management improvement activities, including the integration of farm irrigation system and scheme operations.
7. The establishment/operation of an international institution as a facility to promote and support national programmes on farm water management, with particular reference to training, research, field-level improvement projects and institutional arrangements.

2.2. Conclusions and Recommendations on Specific Issues

Physical System Improvements

1. High conveyance losses in farm channels have been recognized necessitating the need to develop appropriate technology to minimize these losses. The watercourse improvement techniques developed at Mona Project, Pakistan, may serve as a model, subject to local soil and groundwater conditions and socio-economic factors.
2. Water resources should be managed in an integrated system based on surface and groundwater supplies to maximize agricultural production. Water should be treated as an intermediate and not the end product.
3. Large watercourses areas should be reduced to a manageable size for efficient water management. (For a number of countries this will be in the area of 40 hectares and a flow rate in the watercourse of about 1 cusec.).
4. Application of irrigation scheduling on the basis of crop should be encouraged.
5. There is need for a programme of precision land levelling and improved irrigation methods to reduce application losses, crop damage and soil deterioration.
6. Drainage facilities should be extended to include the farm level for effective water management.
7. There is a growing recognition of the need to involve the water users in all phases of the farm irrigation system and its management.
8. The problem of water management should be tackled in its totality rather than just at the farm level. The management should encompass the entire delivery system from source to the terminus.
9. Continuous research programmes should be carried out to support farm water management programmes and adapt technology to local conditions.

Farmers' Organization and Participation

1. The establishment of associations of water users for the successful implementation of farm water management programmes.
2. Bye-laws should be framed to incorporate rewards and punishments in the actual operation of a Water Users' Association.
3. For adequate operation and maintenance of a water course, a channel attendant should be appointed by the Water Users' Association who would define his duties.
4. Water Users' Association may charge an additional amount along with the government's water tax which they can use for ensuring a better watercourse maintenance.
5. To begin with, water users' associations* should remain single-purpose covering the above recommendations. Later they should be encouraged to handle all issues related with improved farm technologies.
6. The Government should establish a system of monitoring an Association's performance.

Training

1. There is a need to change the curricula of the training courses for professionals and sub-professionals to make them farm-water-management oriented in the light of the field requirements of the Organizations engaged in these programmes.
2. It is felt to establish Training Cells for providing interdisciplinary training to the graduated at the university level and similar arrangements are required to be made for inservice training institutes.
3. On-farm water management should be introduced as a compulsory subject for graduation in agriculture and engineering.
4. There is a need for international cooperation and support for establishing and strengthening of the on-farm water management training institutions with emphasis on the following:
 - a) exchange of technology among different countries;
 - b) assistance in development of training material;
 - c) development of local language curricula for training of farmers, and sub-professionals in the various disciplines of on-farm water management technology;
 - d) within the framework of technical cooperation among developing countries, study tours, exchange visits and transfer of technical knowledge among regional countries.

(*) In some countries this may be a cooperative.

5. There is a need to establish in Pakistan a centre of excellence in water management affiliated with the universities and training institutes.

Research Support

1. The implementation of farm water management programmes will need the continued support of research. To be effective, research efforts will have to be directed at specific problems in the farm water management system in an integrated approach of different disciplines. Solutions found, and new adapted technologies developed should be directly applicable to the farmers' field.
2. Pilot projects modelled on, for example, Mona, which operates on farmers' fields to identify problems and develop solutions, are particularly suitable for the execution of such practical, oriented and integrated research efforts. They also serve a useful function in training of technicians and farmers.
3. To support the implementation of national action programmes on farm water management, international cooperation and support is needed. Such international support should aim at cooperation among national FWM institutes, promoting an exchange of experiences, new techniques and methodologies and coordinating national research and training efforts.
4. For this purpose the establishment and/or operation of an international facility would seem most appropriate.

Institutional Arrangements

1. For enabling wide dissemination and adoption of proper water management practices adequate extension services need to be established to organize water users' associations to train their members on proper water management, institute policies and practices to promote the viability of the associations. Whether a separate cadre of water management extension agents should be organized to undertake this activity as distinct from existing agricultural extension agents, will depend on the local situation and the institutional constraints prevailing in each individual country.
2. To facilitate coordination it would be preferable that both the management of the main system and the farm level systems will be undertaken by one agency.
3. Studies should be conducted on meeting the expenses of operation and maintenance from irrigation water fees, specifically on:

- (i) ways to increase the effectiveness of billing and collection precedures;
 - (ii) the possibility of increasing the water rates;
 - (iii) the reduction of O & M expenses through sharing of responsibilities with the water users' associations or through temporary government subsidy.
4. Each country should establish for itself the appropriate size of water users' groups that can viably undertake improvement work and O & M responsibilities in irrigation systems. Generally, these activities should be undertaken at the grass root level, and the group should be small enough to ensure adequate consultations, discussions and participation by each member. It would be desirable to have these small groups form larger groups once they have become viable. However, since the farmers constitute the base of the larger organizations, they should preserve their identity.
 5. Coordination mechanisms to supply credit, fertilizer, seeds, and such other inputs as assistance in marketing and post-harvest techniques are necessary supports to farm water management programmes. Ideally, coordination of all these elements and the agencies providing them should be undertaken by the farmers themselves once they are properly organized. In the meantime, it would be necessary for each government to devise coordination mechanisms appropriate to the conditions.

3. Follow-up Action

To achieve improvement in farm water management at a scale commensurable with the problems, it is recommended that governments:

- Undertake farm level programmes in which the technical, social, economic and institutional problems are analyzed, technical solutions are designed, the farmers are organized in water users' associations, the main system and farm level distribution operations are integrated and services are provided to achieve the efficient management of water.
- Establish irrigation management and extension services at the central government level to undertake the needed programming, guidance, extension and services.
- Undertake the training of field staff at various levels and introduce special programmes in education institutes.
- Set up and strengthen facilities to undertake research in the above fields.

TERMS OF REFERENCE

TAC Study Team on Water Management Research and Training

I. Objectives

The primary objectives of the study, to be conducted by a team comprised of individual irrigation experts, are as follows:

1. On the basis of available reports (and additional information to be collected), to identify the extent to which training and research in irrigation water management are now being performed by:

- (a) existing IARCs,
- (b) existing principal water resources research institutes of universities in developing and developed countries;
- (c) existing institutions, such as FAO, UNDP, UNESCO, CEFIGRE in France and ILRI in the Netherlands; and
- (d) other organizations making significant contributions to training or research.

2. To determine the aspects of training and research activities in irrigation water management which are not receiving sufficient attention, which could provide significant improvements in irrigation water management in developing countries and which might be addressed more effectively through international - as contrasted to national - efforts in this area and to specify the contents of the research and training programmes which might be needed under various alternative courses of action as indicated below.

3. To formulate alternative courses of action for CGIAR support in this area and indicate the pros and cons of these alternatives such as the following and to identify the specific types of problems which would be addressed in relation to each:

- (a) No involvement from CG - other than encouragement of international support for irrigation water management.
- (b) Formation of an institute as set forth in TAC's 1980 proposal.
- (c) A model along the lines of an international service, operating in and using the facilities of a limited number of selected irrigation systems in a few host countries.
- (d) Feasibility of existing IARCs undertaking water management in their ecological environment and the extent to which this might or might not meet the requirements.
- (e) Any other approach which might be suggested as a result of the study.

4. To indicate how the above courses of action would be complementary to activities of other agencies concerned with this subject.

5. In the event that no involvement from CG is recommended Item 3 (a) above), to identify present training and research efforts which should be continued or expanded, and to suggest new activities or steps which could be undertaken to improve and support irrigation project performance in developing countries.

6. It should be noted that "irrigation water management" includes all activities from upstream at the point of diversion or storage to the point of on-farm use, and downstream to the point of disposal from the irrigation areas, and perhaps to the sea.

II. Procedure

1. To recruit and assemble a study team comprised of one or two agriculturists, one engineer and one social economist, all experts in irrigation projects and with multi-country experience, under the guidance of a Steering Group, which in particular would supply expert knowledge of the CGIAR system and objectives. The Steering Group would include representatives of the main interested parties which were present at the ad hoc meeting of the CGIAR members on water management held on July 20, 1981.

2. The Study Team will assemble at FAO Headquarters for about two weeks for briefing, desk studies and formulation of preliminary observations. The Steering Group will meet with the Study Team at the end of these two weeks.

3. A briefing index of relevant documentation would be made available to the Study Team prior to their first meeting. At the first meeting a schedule would be prepared of visits to various institutions and operational irrigation systems in developing countries to obtain needed information not readily available otherwise. During these visits information pertinent to the first five objectives outlined above would be obtained specifically.

4. Field visits would be carried out to selected developing countries, some by part of the Study Team jointly, and if considered necessary, some by individual members of the team. Visits to some institutions in developed countries may also be arranged as required by the Steering Group and/or the Study Team.

5. The Study Team would re-assemble at FAO Rome following the field visits for discussion and drafting of the final report to TAC to be submitted by the Study Teamleader to the Chairman of TAC by January 15, 1982.

6. The final report of the Study Team would be presented to TAC at the 27th Meeting, March 9-14, 1982.