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ICW/80/10

September 15, 1980

FROM: The Secretariat

Consultative Group Meeting

October 1980

Proposal for the Creation of an International Institute for Research and Training on Irrigation and Water Management

Agenda Item No. 7

At the request of the Group the TAC has been investigating the question of research on improving water management practices. A copy of TAC's proposal on the subject is attached for the information of CG members and others attending the Consultative Group Meeting at Manila starting October 30.

The report is entitled "Proposal for the Creation of an International Institute for Research and Training on Irrigation and Water Management" (AGD/TAC:IAR/80/29).

The report will be considered under Agenda Item No. 7 of the meeting.

Attachment

Distribution:

CG Members
TAC Members
TAC Secretariat
Center Board Chairmen
Center Directors

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

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August 11, 1980

Mr. Warren C. Baum, Chairman
Consultative Group on International
Agricultural Research
1818 H Street, N.W.
Washington, D. C. 20433

Dear Mr. Baum:

I am forwarding herewith, on behalf of the Technical Advisory Committee of the CGIAR, a proposal for the creation of an "International Institute for Research and Training on Irrigation Water Management" (IWMI). The TAC is of the opinion that this topic should be placed in very high priority in relation to the attainment of the CGIAR objectives, and that it deserves serious and favorable consideration by the Group. The TAC has endorsed this draft in principle and anticipates that, with some further development, it may be presented for formal consideration by the CGIAR for approval in 1981. Meanwhile, we would hope that the proposal may be discussed by the Group in a preliminary way at its meeting in October, 1980. Suggestions for further refinement and improvement of the proposal are requested from members of the Group.

The TAC recognizes that a great body of knowledge already exists with relation to the principles of irrigation water delivery and use and that the the application of this knowledge involves a great many considerations which may be site specific in nature. However, the failure to achieve or even approach the anticipated and possible level of efficiency and effectiveness for sustained high agricultural productivity and maintenance of soil quality in such a large proportion of existing irrigation systems points up the need for new dimensions of effort in this field. Thus, it is TAC's conclusion that a new institutional approach, based in operating irrigation systems, and utilizing multidisiplinary teams of irrigation and agricultural engineers, agricultural production scientists, and social scientists, with a diagnostic approach looking both upstream and downstream from the point of utilization of water in the crop root zone, is needed. TAC has concluded that such an approach, with a heavy emphasis on in-service training, would be able to develop a nucleus of people with the mind set capable of overcoming many of the deficiencies presently encountered. Such a center would also be expected to become a very important point of focus for stimulating and promoting efforts

and attention for addressing the important constraints limiting irrigation efficiency on a much broader basis in the various countries of the developing world.

During the next few months, in addition to consideration of suggestions from members of the Group, the TAC anticipates further study and refinement of its estimates on the space requirements for the physical plant(s) and in the budgetary requirements for the center. Based on experience of existing IARC's, with some allowance for the different character and manner of operation of this institute, we tentatively estimate that an operational budget (in 1980 currency values) of approximately $5 million may be required at the principal center when fully established (after about 3 years) and that the requirements of each of two satellite units (reaching full operation in the fourth and fifth years, respectively) might be approximately half that of the principal center. Thus, from a start-up fund of approximately $0.5 million the first year, the annual operational budget might reach approximately $10 million after five years. A preliminary estimate of total capital costs is of the order of $5 million for the principal center and $2.5 million for each of two satellites--a total of $10 million over a five year period. These estimates are only preliminary and subject to refinement on more detailed study, but are presented to give an idea of the order of magnitude envisaged. They would be influenced to some degree by the relative costs of construction and operation in the location(s) ultimately selected.

On behalf of TAC, I wish to commend this proposal to the CGIAR for serious consideration and discussion at its next meeting.

Very truly yours,

Ralph W. Cummings

Ralph W. Cummings
Chairman, TAC

RWC/lw
Enclosures

AGD/TAC:IAR/80/29
Restricted

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

PROPOSAL FOR THE CREATION OF AN INTERNATIONAL INSTITUTE FOR RESEARCH AND TRAINING ON IRRIGATION WATER MANAGEMENT

TAC SECRETARIAT
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, August 1980

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PROPOSAL FOR THE CREATION OF AN INTERNATIONAL INSTITUTE FOR RESEARCH AND TRAINING ON IRRIGATION WATER MANAGEMENT

1. The Proposal in Outline

1. The TAC anticipates recommending to the CGIAR the creation of an International Institute for Research and Training on Irrigation Water Management. The Institute would address all features related to the optimization of water use for irrigated crop production, starting with the moisture regime in the root zone of crop plants and moving downstream to the ultimate consumption or disposal of water and accumulating salts, and upstream to the source of water or of its diversion from the source. Emphasis would be placed on diagnosis of the constraints or limitations to the most effective use of water for crop production and on research designed to find replicable solutions to the various problems encountered, of whatever nature they may be (engineering, design, construction, management of canal systems, distribution on and among farms and fields, economic considerations, social management, drainage, etc.).

2. The in-service training of irrigation specialists to enhance their capabilities for diagnosing and solving problems which they may encounter and which may limit the efficiency of utilization of irrigation water, will be a major feature of the Institute's programme.

3. The Institute would consist of a central headquarters and two or more smaller satellite units with comparable operational functions, the total to be able to address the wide spectrum of irrigation water management problems of the major ecological zones of the world (for example, the monsoon climate with distinct wet and dry seasons, the wetter tropical climates of the equatorial zones, and the drier regions in which cultivated crop agriculture is not possible or is at best quite risky without dependable irrigation), as well as the full range of water supply, delivery, use and disposal in each. Each unit would have a modest physical plant consisting of offices, diagnostic laboratories, service warehouses and shops, classrooms, and trainee hostels (about 10 hectares of land should suffice). The units, both principal and satellites, would not own and operate experimental farms but would be located in situations in which they would be able to utilize existing operating irrigation systems in their vicinities representing a variety of water management problems, for their field laboratories.

4. The core staff of the principal unit would consist of about 20 to 25 senior scientists with the stature and experience to enable them to identify and diagnose limiting problems, devise research strategies for their solution, provide inspiration and guidance to trainees, and command the respect and attention of administrators and decision makers responsible for irrigation system management. The senior staff, in addition to the Director and his support group, would be about equally divided among engineers, agricultural scientists, and social and managerial scientists or specialists. They would be expected to operate as an inter-disciplinary team with a strong emphasis on diagnosis and problem solving. Training of irrigation specialists, through participation in in-service operational research,would receive heavy emphasis and would strongly focus on the irrigation problems of any given situation in terms of the system as a whole. Groups of trainees from the host country and other countries of the region would be closely associated with the institute staff in the process of diagnosis and of devising strategies for the solution of problems encountered.

5. It is anticipated that, during the first two years, full attention would be given to the development of the principal unit, but that the Director and senior staff be encouraged to travel extensively to other zones and regions to familiarize themselves with the mix of problems to be encountered therein, and with the talent and effort available in those zones. In this manner a coordinated network in which the institute and the various national, regional, and international components would be mutually reinforcing, would be rapidly built up. After the principal unit is well established and functioning, some of the staff of this unit might form nuclei for satellite units (estimated at 12-15 senior scientists each) in other ecological or geographic zones.

6. The estimated recurring cost of the principal unit when fully established at present currency values, is approximately US$5 million annually. Capital (non-recurring) cost is estimated at approximately US$5 million for the principal centre. The cost of each satellite unit would be about half of these figures for capital and for recurring costs respectively.

7. A start-up fund of approximately US$0.5 million for the first year should be made available to the agency chosen for implementation.

2. Background and Justification for Establishment of an International Institute for Research and Training in Irrigated Water Management (IWMI)

8. Irrigation water management is a major constraint in achieving the goals of food production in the developing countries for the remainder of this century. Inadequate water management has in most of the developing

countries seriously limited the impact and response obtained from investments in irrigation systems and from the introduction of improved crop varieties, pest control measures, fertilizers and other practices designed to increase production.

9. TAC has been considering this topic for several years, it has reviewed various relevant documents, and has had the benefit of analyses conducted by several field missions and consultations, in the light of which TAC has concluded that improved water management in irrigation systems would have an important impact, not only on increased food production but also on improved equity of benefits.

10. The importance which governments of the developing countries and international financing agencies attach to development and utilization of water resources for agriculture is indicated in their present pattern of investments in the development and improvement of irrigation schemes. A few examples will suffice for illustration.

11. In projecting the investment requirements for meeting food and agricultural production needs for the fifteen year period from 1975-90, it has been estimated by the Trilateral Commission that about US$53 billion would be required in South and Southeast Asia in improvement and extension of irrigation systems.

12. Present projections in India alone call for doubling the present area under command of irrigation systems by the end of the century. This would entail the development of approximately 2.5 million hectares of newly irrigated land each year over the entire period, as well as very substantial work in improvement of existing systems. Current investments in irrigation development and improvement in India are running about US$3 billion annually. Pakistan's agricultural production is uniquely dependent on irrigation and US$1.15 billion have been allotted for 1979-84 to the Water and Power Authority, whose water management improvement programmes extend from main canals to village level distribution channels.

13. Irrigation is the major item of investment supported by the World Bank and of the regional development banks in countries of Asia, Africa and Latin America. The World Bank, for example, is currently investing approximately US$2 billion annually in support of irrigation development and improvement projects around the world. Its investment in irrigation in India alone is currently of the order of US$700 million per year.

14. Countless examples could be cited in which land quality has deteriorated rapidly within a few years after irrigation water was made available. This has resulted from rising water tables, waterlogging of the surface soil, salt and sodium accumulations, and a variety of other effects. In Pakistan alone, some three million hectares of land to which around 25 thousand hectares are added annually, have already been affected

by salinity and rising water tables. More than 3.5 million ha of the total 4 million ha of commanded area in Iraq have been scheduled for reclamation by reconstruction of distribution and drainage networks. Presently, less than half of its commanded area is cropped and yields are very low.

15. While much is known about the principles of water storage, transport, and delivery, it is becoming increasingly apparent that the efficiency in use of irrigation water supplies is very much lower than had been estimated earlier. For example, some of the irrigation systems in Pakistan were designed, assuming that 80% to 90% of the water released at the moghas from the distributaries into the farm water courses would reach the crop root zone in the fields. Instead, it has more recently been found that the losses are very much greater, with only 35% to 60% of the water released into farm water courses actually reaching the point of use. This varies at different parts of the water course, with often excessive over-use, leakage, and loss near the head of the water course and no water or very poor dependability of water supply at or near the tail end.

16. Improvement in the efficiency of water delivery from present levels to something approaching those initially assumed, would very substantially increase the area which could be effectively irrigated with presently developed water supplies, and would also enlarge the crop areas which could be served by new systems.

17. Improvement in the dependability of water delivery to all parts of the command area would reduce production risks and, therefore, allow a more widespread use of yield increasing production technology, improved seeds, fertilizers, etc. resulting in a very substantially increased level of crop production on the land presently tilled.

18. To remedy the current deficiencies and to optimize the use of water, there is an urgent need to supply expertise capable of diagnosing the problems and of carrying out investigations to supplement, adapt and apply information related to all parts of the irrigation systems. This includes the design and operation of the water delivery systems from the point of diversion of the source, through the allocation to and application on the land where crops are grown, and the development of appropriate drainage systems to maintain suitable depth of water table and to remove excess salts. As these problems are of a physical, biological and socio-economic nature, a multidisciplinary approach is required. This demands not only a rigorous applied and adequate research program but also a vast expansion of the very limited number of personnel well trained across the fields of agronomy, engineering and related disciplines, capable of addressing these problems. Therefore, a substantial education and training programme is needed to increase the number of qualified personnel to a meaningful level for the required impact.

19. Success in achieving these goals is thought possible, but this will require an effort of critical size, a firm and continuing commitment, and a large measure of international cooperation.

20. Development of research and training to achieve the sort of major breakthrough hoped for in the area of management and productivity of irrigation systems requires a high degree of concentration of efforts and talents. One way of attaining this is to have a group of sufficient size of interdisciplinary expertise working together under dynamic scientific leadership within an appropriate and flexible institutional structure.

21. There are numerous programmes and projects, both national, regional and international, with the objectives of improving irrigation water management in various parts of the world, but no undertaking of the required nature and scope is presently available. This calls for the launching of a new international initiative.

22. The success of the existing CGIAR supported international centres lends great strength to the suggestion that a similar achievement is possible in the area of irrigation water management. It is accepted, however, that problems here are far greater and more complex than in other areas, but, if anything, that should enforce the call for an urgent and concerted international effort.

23. Moreover, the very success of these international centres, especially in providing high yielding varieties of major food crops, is rendered less effective in many parts of the developing world, due to poor irrigation system management, despite massive capital investment and efforts. Although more investment and development work is needed to bring more land under irrigation production, present and past experience shows all too clearly that the pay-off of such investment is far below declared targets due to alarmingly poor performance and this trend needs to be reversed.

24. The main responsibility for addressing such problems lies ultimately in the hands of national institutes and authorities, but to do so effectively they need to be strengthened and supported by an international undertaking of a nature, magnitude and scope such as the one proposed here.

25. Although many problems are and will remain of location specific nature, there is a great common element among them, which impedes development of efficient water management and productivity in many developing countries. Therefore, a concerted effort at international level is urgently required, possible only through the establishment of an international centre for research and training in irrigation water management. Only such a centre can play a major role in generating the magnitude of activities and interest needed, and assume a catalytic role to enhance

the development and strengthening of national research and training activities, while ensuring the greatest possible cooperation and complementarity between various national, regional, and international activities and programmes.

3. Principal Objectives

26. The primary objective of the institute would be to develop the knowledge, principles and scientific expertise required for improving the design, operation and management of irrigation and drainage systems at various levels.

27. With a focus on optimization of the returns from and use of water in the root zone of crop plants, the programme of the institute would be directed toward the identification of the problems and constraints limiting the most effective use of irrigation water in various types of irrigation systems. It would devise strategies and carry out research which would develop the necessary information to remove these limitations. With joint participation of staff and trainees, these procedures would serve as vehicles to accelerate and improve the multidisciplinary training and competence of national personnel involved in the design, operation, and management of irrigation and drainage systems at various levels. It would be designed to enhance their competence to analyze the operation of irrigation systems of various types and under varying conditions, to diagnose any constraints encountered and determine or develop the packages of information and technologies appropriate to alleviate these constraints.

28. The institute would engage in research where knowledge is insufficient and/or technologies inadequate for the proper design and management of irrigation and drainage systems or for solution of the field problems encountered, and encourage application of the results obtained. It would also encourage the development of effective national research and action organizations which lack such capabilities.

29. In addressing the deficiencies of the entire irrigation system, the institute should give explicit attention to the interface between the main delivery and drainage systems and the water use at farm level. It would aim particularly at a better mutual understanding by the engineers and agronomists of their respective problems and of those of the farmers and at a better cooperation among them in the design and management of irrigation and drainage systems. It would also provide useful information to policy makers and decision makers in the field of irrigation development.

30. The ultimate objective would be independent national competence, starting with a better awareness among policy makers and a political will to give sufficient priority to the improvement of irrigation water manage-

ment, a growing involvement of national universities and other research and training institutions in this field, and resulting in a national capacity to field multidisciplinary water management teams both in research and in management of irrigation systems in countries where irrigation and drainage are important.

31. The institute should have a significant influence on the approach of officials concerned with the conception, design, financing and management of irrigation systems, and on the agricultural and engineering institutions involved in the training of future generations of personnel responsible for national irrigation programmes.

4. Structure

32. The institute would have a principal unit, located in an area where irrigation is a major concern in agricultural production, and which provides easy access to a wide range of irrigation problems. Therefore, it should preferably be located in an area somewhat intermediate in climate and adequacy of natural water supply, but having relatively ready access to and communication with areas which are more abundantly supplied with water and others which are less abundantly supplied.

33. Ultimately, the institute will have two or more satellite units, located in substantially different ecological zones, and, thus, would have substantially different mixes of problems to be addressed in achieving optimum use of available water supplies for crop production.

34. The satellites and the main unit would cover the following regions: 1) the regions with a monsoon climate characterized by distinct dry and wet seasons; 2) the equatorial zones with a wetter climate; and 3) the drier regions in which cultivated agriculture is not possible or is at best extremely risky without irrigation.

35. The entire institute would be under unified management with a single Governing Board and one Director-General. The Director-General, located at the principal unit, would be assisted by one or more deputies as may be required for handling the responsibilities in research, training, institute management and finance. A single deputy might handle more than one of these functions. Each satellite unit, when established, would be under a Deputy Director-General, responsible directly to the Director-General at headquarters, thus assuring an unified programme and method of approach. The Deputy Director-General of a satellite unit would have to be delegated considerable freedom and responsibility for its operation, within overall guidelines established by the Governing Board but maintaining good communication with the headquarters unit.

36. The headquarters professional programme staff would consist of approximately twenty senior members in addition to its directorate, including one or two with specialized responsibility for organizing and, with the assistance of the other professional staff, conducting training programmes for professionals drawn from cooperative programmes in the host and other countries. The remainder of its professional staff would be about equally divided among engineers, agricultural scientists and social scientists. Being able to draw on the experience and assistance of staff of the principal unit, the satellite units would each require a staff about half the number of the headquarters.

37. The respective units would need office space, class-rooms, hostels for trainees and visitors, laboratories for supporting diagnostic and applied research, warehouses for storage of field equipment, and shops for equipment and vehicle repair and for fabricating various devices needed in developing, measuring and regulating irrigation water supply, delivery and disposal.

38. Existing irrigation command areas in the vicinity of the headquarters and of the satellites would be used as field laboratories for diagnosis, research, and the development of measures required to improve the efficient management of irrigation water for crop production. A clear and cordial understanding with the officials in these irrigation command areas and their full cooperation is understood as an essential prerequisite.

39. As mentioned elsewhere, the efficient use of water in the root zone of the crop would be the focus of attention for the institute. Inter-disciplinary staff teams (engineers, agricultural scientists, management and social scientists) and trainees would be expected to use a diagnostic approach moving upstream in the supply and delivery system, in field agricultural technology,in the society of water users and water supply managers, and downstream in the water disposal systems to identify any constraints or problems which may have a bearing on the optimum return from available water. Having identified possible constraints at any points, these teams would be expected to devise strategies of research or measures to overcome these constraints.

40. It is anticipated that, during the first two years, attention would be centered on the development of the principal headquarters unit. Meanwhile, it would be essential for the Director-General and his principal professional staff to travel extensively and establish contacts widely within the host country, the region and other regions, so as to become acquainted with the problems of these areas, the responsible professional people involved, other research and training programmes and the needs in the field of irrigation water management, and to begin to lay the foundations for a broad cooperative network, in which the work of this institute could achieve maximum complementarity with other programmes.

41. It would be expected that some of the staff of the principal unit might form the nuclei of staff for satellite units, the first of which might be initiated during the third year, and a second perhaps in the fourth year.

5. Governance

42. While the affairs of the institute during its initial formative stages might be guided by an interim sub-committee of the CGIAR, this would be replaced as soon as may be feasible by a governing board. It is suggested that the initial Governing Board, selected by the interim CGIAR sub-committee with the assistance of an implementing agency, might be about twelve in number, with the understanding that this may be increased to a maximum of fifteen members subsequently.

43. The Governing Board might be constituted more or less as follows:

Director-General, ex-officio. If the Governing Board has not yet been constituted, the first Director-General might be selected by the interim CGIAR Sub-committee.

After the Governing Board is constituted, it would have the responsibility for the selection of subsequent Directors-General and Deputy Directors-General. The Director-General would be responsible to the Board as a whole and would be obligated to carry out the programme laid down and agreed to by the Board.

One member (perhaps two), designated by the host countries of the principal and satellite units.

One member from the host country where the principal unit is located, and upon selection of the location for the first satellite unit, one member designated by its host country.

Ten members (ultimately twelve), selected at large.

These members would be expected to serve in their personal capacity and not as instructed members of governments or their employing agencies. They should be selected from among persons with a high professional stature, with broad experience in and/or knowledge and appreciation of problems of irrigation development and practice. The ability to consider and conceive new and novel approaches, and to think across multidisciplinary lines would be important. To the extent possible, a wide geographical range, experience and background in a range of relevant professional disciplines, and persons from both developed and developing nations should be included in the Board membership.

44. The normal term of Board membership, with the exception of the Director-General and the host country nominees, would be three years with the provision that Board Members would be eligible to be considered for a second three-year term. On the first Board, approximately one-third of the members would be selected by lot to serve for two, three and four year terms respectively. Additional Board members, when required, would be nominated by the Board, subject to the approval of the CGIAR. Successors to the members-at-large, on expiry of their terms of appointment, and vacancies occurring for other reasons would be nominated by the Board and subject to approval by the CGIAR.

6. Method of Operation and Programme Outline

45. Research would concentrate on the development of technologies appropriate for the conditions of developing countries and on the selection of suitable packages of these technologies for each command area. Due attention would be paid in the research and training programmes to the institutional and socio-economic aspects of water management. All scientists of the institute would be engaged in both research and training.

Research programme

46. The major mode of research implementation would be field oriented in the operation of irrigation systems. The research would be applied and operational, focussing on the diagnosis and understanding of factors limiting the performance of irrigation systems and the identification of means to improve that performance. Where appropriate, this would include modification of features of the basic design of the system.

47. The disciplinary composition of the scientific staff should allow consideration of a range of possible factors, including engineering, agricultural, institutional and socio-economic aspects; the latter would involve not only economists, but also sociologists and/or anthropologists.

48. The key research problem would be, how to improve the performance of irrigation systems. It could best be approached by dividing it into a series of more specific problem areas. Topics deserving consideration would include but would not be limited to the following:

(a) Water resource management and development strategies. Particular attention should be given to appraising the potential of alternative strategies for improvement, development and management on the basis of criteria such as: productivity of water use; equity in water distribution; environmental stability; and institutional, social and economic considerations.

(b) Technological and operational aspects of water allocation and drainage. Research should be directed toward the improvement of unsatisfactory performance of irrigation systems, due to such problems as: quality of irrigation water; water logging, sodicity and salinity; poor design and maintenance of the irrigation distribution network; inappropriate measuring procedures to monitor the control of water distribution; high level of water loss in the conveyance system.

(c) Cropping systems for efficient water use. Special attention should be given to designing cropping systems and intensities which make more effective use of available water supplies. Considerable crop and water response information may be obtainable from international and national crop research institutions.

(d) Information flows. Investigation of the supply of information between the system operators and the water users to ensure adequate, timely and reliable water supply.

Training programme

49. The trainees would be selected and come in teams from participating developing countries. The team from each country should include the range of disciplines and background required to diagnose the problems encountered in the field, including engineering, agricultural, institutional and socio-economic backgrounds.

50. The main category of trainees should be able to become trainers at both professional and sub-professional level in their own country. Therefore, the training programme of the institute should be of such character and quality as to merit professional and academic recognition. Another category would be managers and administrators of irrigation projects. Upon completion of their training, the trainees would normally return to their original posts.

51. Although subject to change as experience suggests, it is anticipated that the principal training courses would comprise groups of 30 students and tentatively might be expected to cover a period of approximately six months. The exact duration of the course would be subject to modifications as experience suggests. Initially, two such groups would be trained simultaneously in the main unit. One part of the course would provide supplementary training in the aspects of water management which fall outside the basic training of each sub-group of students in their respective disciplines. This part of the course would be conducted in classroom lectures, discussions and exercises, addressing solutions to case studies. The other part of the course would be devoted to field investigations in the command area of the unit, working at the village and farm level. The

students would work in small teams to include the various disciplines represented, in order that they may learn from each other and get the experience of working together.

52. The institute would maintain contacts with the trainees when they return to their home countries in order to provide the necessary back-stopping, as well as support to pilot research projects in these countries. In this way, the international programme would assist in the build-up of a network of research and training institutes in irrigation water management and drainage.

53. With exposure to a substantial range of irrigation systems and problems, it would be expected that the staff and trainees would substantially improve their ability to address new and different problems and constraints, which might be encountered in other systems with which they may subsequently be confronted.

54. The associated command area of the main unit would be the first beneficiary of the programme and would become a living example for replication in the command areas of the satellite units and eventually in other associated countries.

7. Staff Requirements

The following range of senior staff would be anticipated:

55. At Principal Unit

- 1 Director-General
- 1 Deputy Director-General for Research, Training and Cooperative Programmes
- 1 Business cum operations manager
- 2 Training officers
- 6 Agricultural scientists (drawn from such fields as agronomy, soil physics, soil and water chemistry, soil fertility, agricultural engineering, plant physiology)
- 6 Engineers (with a range of specialized competence in such fields as hydrology and hydraulics, soil mechanics, construction , water conveyance and control, irrigation system management, ground water)
- 4 Social scientists (with a range of competence in such fields as systems management, economics, farm management, sociology and anthropology)
- 1 Information services officer

56. At Satellite Units (each)

1 Deputy Director-General

1 Business and operations manager

1 Training officer

3 Agricultural scientists

3 Irrigation engineers

2 Social scientists

57. The senior staff would be supported by clerical staff, junior scientists, technicians, mechanics, shop assistants, masons, physical plant maintenance people, and general service workers.

8. Facilities

58. The institute would have a relatively light investment in permanent buildings and should be so constituted that its principal and satellite units could be moved without heavy loss of investment, if circumstances should so indicate. A move might perhaps be opportune, if it were determined that the major problems encountered in the area of operation had been solved and, therefore, the area would no longer provide the conditions in which a substantial range of problems could be confronted, thus depriving the staff and trainees of the basis for developing the diagnostic and problem solving mind set or approach. Also changes in the political climate could conceivably make a move necessary.

Land

59. The institute headquarters unit would need an area of approximately ten hectares of land, located where it would have easy access to several different types of irrigation systems in operation or under development. It would not necessarily need to be located within any one of the command areas to which it would have access. The various criteria to be kept in mind for site location are set forth in section 9. It is anticipated that the satellite units would perhaps require slightly less land.

Buildings

60. The following building facilities would be required at the principal unit:

(a) Office cum laboratory and classroom building - approx. ..... ft^2

(b) Offices for senior staff and desk space for supporting technical, administrative, clerical and other staff; chemical and physical laboratories for diagnostic

monitoring and applied research, such as water quality studies, measurement of soil physical and chemical properties, etc.; data analysis and computation facilities; engineering design facilities; limited library facilities; conference rooms and classrooms.

(c) Warehouse cum shop building - approx. ..... ft^2
Warehouse space would be needed to store supplies and field equipment. Shops would be required for repair and maintenance of vehicles and field equipment; for fabrication of water management, measurement and control devices, and of other equipment required for water sources development and delivery, and for the diagnosis and monitoring the performance of the irrigation systems.

(d) Hostels, with dining and recreational facilities - approx. ..... ft^2
Accommodations for approximately 80 trainees and visitors, with common rooms, dining and kitchen facilities, recreation rooms, etc. About 65 rooms could be single rooms with bath and about 10-15 could be double room suites, perhaps with light kitchen facilities. This could accommodate two groups of thirty students each, simultaneously, plus smaller numbers of visiting scientists, administrators and officials.

61. The satellite units would require somewhat similar types of building facilities, though somewhat less room for management, administration and hostel accommodations, than the principal unit.

Equipment

62. Equipment required for both principal and satellite units would include:

- Vehicles
- Office furniture and equipment, including duplication and computation equipment
- Shop equipment
- Field equipment
- Training equipment
- Hostel furniture
- Kitchen appliances

9. Location

63. While the precise location of the principal unit and thereafter of the satellite units, would require a considerable amount of detailed investigation and subsequently of negotiation with potential host countries and the irrigation system officials in the specific areas under consideration, the following are among the important criteria, which would have to be evaluated:

1) Access to a variety of types of systems ranging from large public flow systems, to small traditional ones, and those involving shallow and deep well water supplies, as well as combinations of surface conveyance and ground water supplies. Likewise, access to a range of different types of delivery systems over a variety of topographic surfaces would be desirable.

2) Access to command areas, where some modernization and rehabilitation is in progress, as well as new systems under development. An interest in innovation on the part of the local authorities would be desirable.

3) Readiness of the appropriate government agencies and of irrigation and agricultural authorities in the irrigation command areas concerned, for operational collaboration.

4) Desire of the host government to host the institute and its willingness to accord privileges and conditions necessary for operation of an effective international programme. There should be a reasonable expectation that these conditions would be likely to continue and prevail for a substantial period of years.

5) Year round irrigation supply.

6) Good accessibility in terms of transport and communications.

7) Proximity to an educational institution with excellence in several of the fields related to the institute's programme activities.

8) Proximity to centre or sites of advanced crop research.

9) Availability of support staff who could be recruited locally.

10) Proximity to a population centre, which can provide reasonable amenities to staff members and their families (shopping, educational, cultural, entertainment, medical services, etc.).

64. Taking all presently envisaged factors into consideration, it is suggested that the principal unit be located in South Asia (India, Pakistan, Sri Lanka, Bangladesh, Burma). This area has a monsoon climate, with distinct wet and distinct dry seasons, is somewhat intermediate as to moisture regimes and supplies, and is located between regions of more abundant rainfall to the South East and drier regions to the West. Its access to these different ecological zones by air transport and other means of communication is also quite good. It is a region with very large areas already under irrigation with a wide variety of systems and problems, a region of high population density and urgent need of increased agricultural production, and one in which current and projected levels of investment for irrigation development and improvement are very high.

65. As a first priority for a satellite unit, the Middle East/North Africa region (generally on the drier end of the climate spectrum and much of which has its major rainfall in the winter season) would seem to merit early attention. While it is difficult to be precise about the choice of location within the region, the Sudan, Iraq and Turkey would be among the countries which could be considered.

66. As a second priority for a satellite unit, the wetter regions of East Asia might be selected. In this region, obviously, the Philippines, Indonesia and Thailand would be among the leading candidates for location consideration.

10. Relations with Host Countries

67. A clear and cordial understanding between an international centre and the concerned authorities in the host country is essential for its successful operation. This is even more so in the case of the proposed international institute for irrigation water management, because of its special mode of operation. The institutional set-up differs significantly from other IARCs in that the field laboratories and training grounds would be existing irrigation command areas in host countries. Such a mode of operation would require strong links with and heavy involvement in the irrigation management and operation of the command areas in anticipation of improving the performance of these, since the findings of the institute would be made readily available to the host authorities.

68. While maintaining small but adequate physical plants of its own, the institute would make use as much as possible of the facilities and professional expertise available to it in the host countries. This could take different forms, and might possibly involve assistance to the command areas and/or scientific institutions to help them improve the quality of their work and assure their continued interest and involvement. In short, it is intended that the link-up of the institute with existing facilities of the host countries would go beyond being just a matter of convenience, but would bring about an active mutual involvement and real interaction between them. Therefore, to ensure the institute's successful operation very careful consideration should be given to the legal and practical aspects of the agreement between the host governments and the institute.

11. Cooperation with National and Regional Programmes

69. The programme of the institute is designed to complement and not to replace the existing efforts of national, regional and international agencies, such as the proposed FAO action programme for farm water management. It would be assisted in its programmes of training and research by the IARCs and develop linkages with universities and institutions of education and research in developing and developed countries.

70. Universities and institutes of education in developing countries, where irrigation is of major importance, would be stimulated to introduce the subject of water management and drainage in their undergraduate study curricula and to develop multidisciplinary postgraduate training, as well as training of sub-professional personnel.

71. The institute would make maximum use of existing programmes, institutions and facilities at national level by sub-contracts and other means and have its activities closely integrated with national programmes. It would collaborate closely with institutions in charge of irrigation systems in developing countries and the related programmes of the IARCs, FAO and UNDP, the World Bank and of other bilateral and multilateral assistance institutions.