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REPORT ON THE

EXPERT CONSULTATION ON IRRIGATION WATER CHARGES

Rome
22-26 September 1986

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Report on the

EXPERT CONSULTATION ON IRRIGATION WATER CHARGES

Rome, 22-26 September 1986

FAO Land and Water Development Division

USAID Water Management Syntnesis II Project

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UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

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Preface

This document is a summary report of the results of the Consultation which records the basic results of the meeting. It contains the main findings and recommendations of the participants plus propositons and suggestions from five working groups. Summaries of the background and country papers are included.

This report will be followed by a proceedings volume, planned for publication early in 1987.

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A. THE CONSULTATION

1. Background

This Consultation was planned against a backdrop of ever increasing irrigation facilities costs, constantly diminishing world prices for staple food crops, and weak export markets for raw commodities. These opposing trends are forcing national agencies responsible for development of rural areas into a critical financial situation. The organizers recognized that various conferences had already been held and many reports and papers written about water fees and cost recovery, so that the moment seemed opportune to try to review the results of past thinking and exchange expert views on what suggestions might be offered to nations and international donors by way of policy parameters to help solve current and emerging system management and general fiancial problems involving water charges.

2. Objectives

The Consultation was organized to provide an opportunity for knowledgeable persons from various parts of the world to discuss existing information and offer new ideas on these principal issues:

i. To review existing experience relative to imposing, collecting and utilizing water charges for cost recovery and the rational use of irrigation water.

ii. To consider alternative approaches based on past experience, including policies and practical methods of addressing problems identified.

iii. To recommend solutions and lines of action for donors, international financing agencies and governments in general, as well as FAO and AID in particular, to deal with this ever important topic.

3. Arrangements

The Consultation was jointly organized by FAO and USAID and was held at FAO headquarters in Rome from 22 to 26 September 1986, at the invitation of FAO Officers. All plenary sessions and working group deliberations were conducted in English.

The plenary sessions and discussion group meetings were chaired and reported on by various participants so that most people present shared some official responsibility for the objectives reached during the meeting.

Mr. Juan A. Sagardoy, Land and Water Development Division, FAO and Mr. A. LeBaron, USAID's WMS II Project, Utah State University, acted as Secretaries to the Consultation.

4. Attendance

The Consultation was attended by 34 participants and 3 observers, including 7 senior government administrators from as many nations and 30 participants/observers representing international financing agencies, intergovernment agencies, reaearch centers, and universities.

A complete list of participants and observers with addresses is given in Annex 2.

5. Programme

The programme of the Consultation consisted of a welcoming session, a technical session lasting two and a half days, sessions for special study groups, and two plenary meetings to present and discuss the progress of the special study groups.

The Consultation was formally opened by Mr. G.M. Higgins, Director of the Land and Water Development Division, FAO. Special welcome addresses were presented by Ms. Joan Atherton, on behalf of the United States Agency for International Development, and Mr. P. Dieleman on behalf of the United Nations Food and Agricultural Organization. The Consultation was closed by Mr. Jack Keller, Co-director, USAID sponsored Water Management Synthesis II Project (Utah State University, Cornell University, Colorado State University).

In his welcoming address, Mr. H.M. Higgins expressed FAO's appreciation to the US Agency for International Development for its valuable cooperation in co-sponsoring the Consultation, and to the international agencies and institutions for sending their most qualified experts, which indicated the degree of international concern with such an important issue.

He stressed the complexities of the subject of water charges, and the fact that the technical difficulties cannot be solved without due consideration of the social, cultural, religious, legal and political implications involved, which impose the need for an individual approach adapted to local circumstances.

Although there is a good deal of material on the subject, which presented a serious problem even in ancient civilizations, what is important is the validity of past knowledge in present circumstances and related to the near future. The question of water charges is a dynamic topic that must adapt to new situations.

Mr. Higgins hoped that experts would be able to produce conclusions and recommendations to help countries to establish their own water policies within their irrigation development plans. There had been been a growing demand recently for assistance in this field in view of pressures exercised by bilateral and multilateral donors and banking institutions to increase the fiscal responsibility of recipient countries. It was therefore important for the Consultantion to attempt to provide unified views on this constroversial issue.

Mr. H.M. Horning, former Director of FAO's Land and Water Development Division, presented a keynote address which related the current world-wide irrigation situation in various regions of the world to a number of trends that are seen to be emerging. Rate of expansion of irrigated land has slowed, and the trend seems to be for more intensive use of irrigation resources already existing, except South of the Sahara and in other relatively unpopulated zones.

The programme of the technical sessions was divided into presentations of background and individual country papers. The country papers generally followed the requested format (see Annex 5), and focussed on irrigation programmes in each country, detailing methods, amounts, and rates of irrigation service fee recovery. General policies for financing irrigation costs, and policies for establishing the farmers' responsibilities were also included.

The backgound papers covered a range of topics, but considerable emphasis was placed throughout on the question of the potential for farmers sharing the cost burden of operating, maintaining and financing the systems which provide them with a valuable and necessary production input.

Small working sessions were created to discuss the topics that appeared to be of most interest to the participants. Each working group was assigned two tasks. First, they were all asked to make general recommendations concerning the following question: What is the appropriate focus of water charges, both of national governments and international donor agencies, with respect to goals of a) social equity, b) economic efficiency, and c) satisfactory system management? Secondly, each working group was asked to suggest policies related to various topics, as shown in the following list:

Group 1 Financing Irrigation - Macro Considerations
Group 2 Cost Reduction Measures
Group 3 Revenue Enhancement
Group 4 Setting Irrigation Water Charges (levels and structure)
Group 5 Organizational Structure and Administrative Development

Topics set for each working group are shown in Annex 4. Group members were given freedom to respond to the questions suggested by the ad hoc group that selected the session topics, or to provide modified versions, or to create their own as they saw fit. Generally, no group made significant modifications, but it is clear that some difficulties were encountered.

Reports from the various working groups were received in two plenary sessions, where appointed rapporteurs commented on the individual group discussions and recommendations and recorded reactions from the Consultation as a whole. A brief, composite summary of the various findings from the rapporteurs' written reports was prepared and handed to the participants for their verbal or written comment just prior to the close of the Consultation.

6. Acknowledgements

FAO and USAID express sincere appreciation to all of their respective overseas mission personnel and representatives who graciously took the time to help the authors of country papers make arrangements to join the Consultation in Rome. The World Bank was especially supportive in sending two participants. Further appreciation is extended to all the authors for preparing and delivering such interesting and high quality papers, and to all participants and observers for their personal and collective contributions to the deliberations that took place within the working groups and plenary sessions. Without a keen desire on the part of everyone to go forward with the debate on the topic of the Consultation, very little could have been accomplished.

B. REPORT OF THE MEETING

1. INTRODUCTION

The participants of the Consultation were not only highly specialized in the subject of irrigation water charges but also represented an ample spectrum of entirely different situations involving irrigation development in every region of the world. Consequently, they had switched their minds rapidly from scene to scene and integrated new perceptions as they sought a common meeting point for their experience. This exchange of experiences was undoubtedly extremely positive and has led to some new thinking on this very old subject of irrigation water charges.

And despite the tremendous diversity in irrigation development goals and problems there are widely shared common grounds that constitute the foundation for the Consultation:

a) on the whole, irrigation works get more and more complex, sometimes expensive and difficult to finance; and

b) those that already exist are often poorly maintained and ill-managed;

c) returns from many crops are declining because of stagnant, or even declining international and national prices for agricultural products.

Water charge policies are therefore of great general interest since they are inextricably linked to these present problems.

As the Consultation progressed, it became clear that there were big differences in the degree of success achieved by the reporting countries in implementing water charge policies. While there were several positive examples of countries recovering recurrent costs and a good part of the capital costs, the predominant picture was that it was often difficult to meet even the Operation and Maintenance (O&M) costs from the revenues collected. Countries are meeting increasing difficulties in providing subsidies. This generally results in a deterioration of O&M services leading to a progressive deterioration of the irrigation systems. The causes include poor institutional provisions for the collection of revenues, lack of political will to support and enforce sound water charge policies, and farmers' refusal to pay for the poor services often provided.

On equity grounds alone, the participants of the Consultation agreed that, with respect to farmers on rainfed land, farmers benefitting from irrigation projects should be expected to contribute something to the investment costs and, where possible, pay for the O&M costs. However, at the same time, it was recognized that project farmers cannot be held accountable for faulty designs, inefficiencies in the execution, unacceptable maintenance standards, unjustified risks and any other undesirable actions undertaken by the public agency responsible for the project developmet.

Great attention was dedicated to evaluating the role that water charges can play in promoting greater efficiency in the distribution and use of irrigation water. It was agreed that the main way to obtain rational water use is by a careful allocation to cover the necessary crop requirements and control of the distribution system. The incentive that irrigation water charges can provide to individual farmers to change their behaviour is limited to a very few systems working on demand. In fact, if the distribution can control the deliveries, the farmers cannot take more water than they are allowed. On the contrary, how can the farmer be prevented from taking as much water as he wants if deliveries cannot be controlled? On the other hand, it was acknowledged that irrigation water charges can have a positive impact in improving the management activities of the irrigation system provided that the revenues collected are actually used for the same project where they were generated and a sound organizational structure exists. Accountability resulting from certain kinds of revenue arrangements (but not from others) can supply the vitally important "commitment to manage" that is

often lacking in irrigation bureaucracies. The praticipants therefore call attention of all readers to the Special Statements, where a consolidated view is expressed on this topic.

Considerable attention was paid to the financing of irrigation works and the recovery of these investments. Cost recovery justification, methods and successes were the policy focus of most of the country papers, while some of the background papers also emphasized the same concern. As hinted earlier, country policies with respect to this question vary from no recovery to nearly full recovery (without interest) over a long period of time. Productive investments should need minimum subsidies while unproductive ones may need total or partial subsidies for an indeterminate length of time. Economic or engineering theories are of little use in making subsidy decisions as they often reflect a political choice. The Consultation felt that providing specific guidance in this area was unpractical, but recommended that in general subsidies should be avoided whenever this was possible.

The participants acknowledge the fact that O&M costs are often unnecessarily high, sometimes due to faulty design but more frequently to poor management practices. Therefore the Consultation calls for greater attention to the reduction of O&M costs at the design and operational level. The latter requires delicate balancing between what is desirable from a technical point of view and what can be achieved from available resources.

There are also a number of ways to cut maintenance budgets. Some engineering considerations are mentioned in this document. What should be stressed, however, is that these options reveal a need for some new thinking by engineers about their responsibilities for careful cost effective design. An important idea is to obtain second opinions on designs and costs from operation engineers from their perspective - once it is known that their work is being scrutinized by those in charge of operating the system, design engineers will deliver more practical systems.

Levels and structures of water charges should be set with due consideration to the farmers' ability to pay. However, the Consultation noted that the farmers' future income is often overevaluated and there is need for reassesment when the project is actually in operation. When the expected farmers' benefit is less than average irrigation costs, then subsidy arrangements and attendant problems cannot be avoided.

Great emphasis was also placed on the need for increasing the accountability of system managers to farmers, as a way to reduce cost and improve overall performance. Another theme directly related to this point is that of decentralization of irrigation bureaucracies, to the degree possible, and a move towards more reliance on farmers to take over some operation and management functions where possible. A number of examples were cited of projects that operate more or less autonomously and which are auto-financed to some degree. Thus, decentralization may be part of larger institutional, structural adjustments packages that involve such policies as ear-marking the O&M portions of fee collections (irrigation service fees) for use in the districts where originally collected.

A primary goal of decentralization is to devolve responsibility, and therefore accountability, to successively lower levels in an organization. In the case of irrigation agencies, this generally means shifting operational decisions to the district or system level, and tying operational budgets to local revenue generation. An important consequence of this process is increased communication between farmers and irrigation system managers, which should lead to greater awareness of their common interests and their concurrent need to be accountable to each other for revenue generation and reliable service, respectively.

2. MAIN CONCLUSIONS AND RECOMMENDATIONS

2.1 Special Statements on Water Charges

i. Equitable and reliable distribution of water is the key to achieving efficient use of water. Water charge policies are unlikely to have any significant impact on the efficiency with which individual farmers use water, except in those extremely rare situations where at the same time:

(a) water is very scarce and has a high farmer and general social value;

(b) the irrigation system delivers water on a demand basis, i.e. in response to ad hoc requests from farmers during the irrigation season; and

(c) water deliveries to farmers are measured.

ii. Achieving satisfactory system management has higher priority than solving any problems related to water rates. Moreover, success in the latter is likely to occur only in conjunction with the former. The way in which fees are assessed, collected and expended is more important than the actual level of fees in improving system efficiency and effectiveness. The most critical factor is the level of fiscal autonomy of the irrigation agency, i.e. the extent to which the level of its operating budget is tied to the amount of revenue generated by its operations. This provides an incentive for cost-effective goal-oriented performance that is otherwise often weak or lacking.

iii. Water charge policies are not an effective method of dealing with broad issues of social equity, such as rural/urban income disparities or highly distorted land ownership patterns. Other policy instruments for dealing with these issues are preferable.

2.2 Macro-Policy Propositions

i. Governments must devise politically supportable water charge policies for system management and investment cost recovery which must be actively supported by the politicians.

ii. Water charge policies need to be broadly compatible with overall government policies toward the pricing of services in both the agricultural and non-agricultural sectors.

iii. Administrators must devise and sustain systems to enforce the application of water charge policies. The costs of collection (including personnel, physical structures and administrative procedures) need to be evaluated carefully, and ways sought to minimize these costs relative to the revenues generated.

iv. Governments should consider policy changes to increase the financial autonomy of government agencies managing irrigation systems. Policy change need not result in complete self-reliance, but should lead to operating budgets that vary directly with the revenues generated by the operations of the agency.

v. Donor agency policies concerning irrigation development and recurrent cost recovery should be clearly defined and, where possible, consistent with each other. They should be responsive to special local needs and sensitivities.

vi. All benefitted farmers should contribute something (cost/labour) for the provision of water inputs. Equity considerations within irrigation projects, between public and private schemes, as well as between the irrigated subsector and rainfed agriculture support the proposition that subsidized water users should make a contribution to repay some of the irrigation investments.

vii. Cost reduction in system design and future O&M should be brought into harmony with social, environmental and production goals. Techniques of least-cost maintenance (and operation) is a blind spot that has been neglected by the engineering profession. Engineers should be pressed to provide realistic estimates of future O&M costs and as far as possible to foresee solutions to the problems associated with their implementation. This will require a multidisciplinary approach in most instances.

viii. Decentralization of operational and financial responsibilities within irrigation schemes should be encouraged in order to create conditions favourable to both increased farmer involvement and increased agency accountability. The development of strong farmers' organizations with operational and financial capabilities is one way to move in this direction.

ix. Water users should be involved in the decision processes for establishing water rates at the project level. In the first instance farmers are particularly interested in the amounts spent upon maintenance and operation and the amounts ostensibly collected. There should be clear linkages between the financial responsibilities of water users for irrigation costs and the accountability (to the water users) of those responsible for the operation of the irrigation system. As far as possible, capital expenditures should not be made until agreements are reached between water users and the implementing agencies regarding the financial responsibilities of each.

3. PROPOSITIONS AND POLICY RECOMMENDATIONS OF THE WORKING GROUPS

The participants in the special working group prepared the following conclusions and recommendations.

3.1 Financing Irrigation - Macro Level Considerations

3.1.1 Donor approaches to financing irrigation in relation to recipient countries.

i. Major differences exist in the approaches followed by the main donors as far as the impact on host economies of financing of irrigation works is concerned.

ii. Financing of rehabilitation works is treated in the same way as financing of new irrigation projects, although it was recognized that rehabilitation projects offer an unique opportunity to review questions related to water charges and implement them effectively.

3.1.2 Implication of financing projects that do not pass conventional economic viability tests

iii. Many irrigation schemes cannot pass economic tests. They were selected for political reasons. These reasons may be to take resources (livelihoods) to backward areas, to delineate national borders, to create a national awareness and so forth. On the other hand, projects may stem from political involvements. Once they are established they are sunk costs and decisions to proceed should hinge on marginal costs and benefits. Farmers should participate in financing in line with overall national policy and in relation to O&M costs and benefits (or ability to pay).

iv. Where administrative devices such as tariffs make an uneconomic project financially profitable, but socially harmful, (e.g. some domestic irrigated sugar production), there is much to recommend heavy charges. However, the interests

that obtained the protection from international competition would also be likely to obtain shelter from local user charges and taxes.

3.1.3 Levels of subsidies

v. To move away from subsidies was considered advisable in most instances and it may lead to improvements in the overall economy of the country. However, it was recognized that subsidies covering part of the irrigation costs (capital and recurrent) were the general prevailing condition with the exception of some private irrigation developments.

vi. Unfortunately, in theory, if an economy has distortions in several interdependent areas an improvement in one distortion is no guarantee of an overall system improvement. In practice, irrigation has a role to play in the general move to reduce and/or eliminate public sector subsidies and reduce costs in countries as diverse as China and Mexico. No general guidance or orders of magnitude can be given as these depend on the level and type of subsidies and taxes (distortions elsewhere in the economy), within the agricultural sector in irrigation and on the scheme itself. However, the meeting agreed that all participants in irrigation, from agencies to engineers, have a responsibility in the current climate to reduce subsidies and costs.

vii. On the other hand, farmers should not be asked to repay the cost of over-elaborate gold-plated designs, incompetent, expensive construction, cost overruns for reasons of corruption, bad scheduling of construction activities or the like, nor overmanning of the public sector. This latter problem requires tougher action and finance to ease the transition to greater efficiency. Donors may be able to help with finance, particularly if they hold local currency counterpart funds.

3.1.4 Externalities and their treatment

viii. Surface irrigation schemes that involve the spreading of canal waters over wide areas of a basin away from drainage courses can lead to unfavorable externalities such as waterlogging and salinization of farm lands both within and outside the scheme. Likewise, the resulting percolation of such canal water can also recharge aquifers that might be suffering depletion by over pumping by private tubewells both within and outside the scheme. Canal water charges and canal scheme management might need corresponding adjustment to account for the above externalities.

ix. In principle externalities should be internalized, that is to say, paid by those causing the damage. Difficulties clearly arise, all the more so if the damage is caused by populations across an international border. If unfavorable externalities cannot be internalized, government will have to assume responsibility.

3.2 Cost - Reduction Measures

The Consultation paid particular attention to this topic as reducing O&M costs will make the management of the systems more effective and reduce the burden of O&M costs to farmers. The aim is therefore to achieve satisfactory management of the system with eventual reduction in O&M costs.

i. First of all we should define what we mean by satisfactory management of irrigation system operation and maintenance. Satisfactory operation implies delivering to each farmer his/her share of the irrigation water supply in as timely a manner as practically possible within the physical restraints of the system. This mandate requires the operators to capture and deliver all the water the system is entitled to and minimize operational losses of water which can be used beneficially by the farmers.

ii. Satisfactory maintenance should be pragmatic in nature and be sufficient to maintain the operability of the system to meet the above objectives. Maintenance should be scheduled in such a way that the cost of maintaining is less than the cost of not maintaining. The benefit/cost (B/C) of the maintenance programme should be maximized within the constraints of personnel and budgets (the benefit of maintenance is equal to the cost of not doing the maintenance). One might call such a programme pragmatic maintenance. Some examples of the cost of not maintaining something are: premature breakdowns, water loss, operational inefficiency, etc.

iii. There is a fine line between what might be termed rehabilitation and what might be termed maintenance. This is especially true for such things as repair of canal lining because, except for patching, system-wide repair (like resurfacing roads or roofs) would necessarily have a very long cycle time. The worry here is when new construction and rehabilitation are given high subsidies and O&M is paid for by direct water charges to the farmers, or when aid is available for rehabilitation but not for maintenance.

iv. In order to reduce O&M costs we have these options: be more efficient in managing the O&M activities; transfer certain O&M activities to the water users, and design and construct systems which are efficient to operate and maintain.

v. Efficient management of O&M requires careful attention to detail and this is seldom given. One starting point would be to make O&M management a more rewarding activity and insist on having highly qualified management and key staff which are held accountable for the actions (or lack of actions) through more direct farmer involvement, for instance by having their representation on the management board, or by putting farmers in the position of customers who have to be satisfied if revenues are to be generated for management activities and salaries.

vi. To design and construct irrigation systems for more efficient and cost effective O&M much more attention needs to be given to O&M in the project appraisal and design phase. As far as the design is concerned the following measures are relevant:

a) To reduce maintenance works, better techniques related to the design of headworks structures, wells, pumps, silt reduction, flood protection, leakage prevention, and quality control during construction are particularly needed.

b) To develop appropriate criteria to accommodate periodicity of maintenance. On this particular aspect the use of life-cycle costing techniques was recommended, where the the sum of capital or investment cost plus carefully designed O&M costs is minimized. Furthermore, using appropriate discount rates to annualize capital costs in order to avoid dealing with inflation factors in determining future O&M costs is also advisable. Using life-cycle costing (LCC) provides a rational means for properly capitalizing systems.

c) Avoid use of fixed percentages of the capital cost to determine O&M expenditures. In calculating O&M costs, standard figures, i.e. of 1, 2, 3 percent of capital cost are not satisfactory. What must be done is to construct a detailed O&M budget with realistic site specific values. Life-cycle times should also be realistic in terms of the socio-institutional environment encountered as well as the physical circumstances. One cannot expect islands of excellence to exist in the context of O&M activities; for example, if it is obvious that machinery maintenance will be of a low quality then machinery life should also be reduced.

d) Create conditions for more feedback from O&M Departments with those in charge of designs in order to promote better designs.

e) Design systems using indigenous material. This measure is not only useful in reducing the capital costs but also in minimizing maintenance problems. With materials easily available, repairs are likely to be executed faster and cheaply.

c) public funds used to match farmers' contributions.

Over time the mix should be composed of more of a) and b) and less of c).

ii. Note that some efforts to enhance revenues may help in recovering investment costs as well. An important element in investment cost recovery is to take into consideration the windfall gains in land values obtained by farmers benefitted through irrigation development. Indeed, there is a link between land ownership and recovery of society's investment: if water users are not land owners, perhaps their responsibilities in cost recovery should be adjusted to the actual situation.

Specific Recommendations

The following statements are based on the assumption that the government has the political will to do two things regarding O&M activities: (i) clearly specify its expeccations regarding farmer responsibilities for O&M, and (ii) collect the fees. If these enforcement policies exist, the following actions will enhance the mobilization of O&M resources.

iii. Provide quality irrigation deliveries and maintain order throughout individual systems.

iv. In certain national and physical settings there will be considerable opportunity to enhance O&M resources by mobilizing farmers to implement O&M activities directly at some level in the system. However, such mobilization depends on the following conditions:

a) there should be clearly developed policies regarding the rights and responsibilities of these farmer groups, including their right to be involved in system management decision-making and to levy and collect fees within their own user groups;

b) to the extent possible, a system layout should be created that establishes water management blocks that are technically and socially manageable by the farmers' groups, and

c) that such groups be provided with the necessary assistance to create and/or strengthen their groups through training, organizational assistance, etc., and

d) legislation may be required to define clearly the rights and responsibilities of both farmers' groups and the irrigation agency regarding O&M activities. This legislation should also establish procedures to ensure the compliance of both parties.

v. In cases where government is providing assistance to existing farmer-managed systems, policies should be adopted to avoid government assuming responsibility for routine O&M activities and costs.

vi. Given that ownership has a positive impact on accepting responsibility, there may be an opportunity in some countries to provide farmers with the ownership of some portions of the irrigation network (e.g. the tertiary facilities), or ownership of maintenance machinery, or of water rights.

vii. In some cases, it may be possible for an irrigation system to generate secondary sources of income to supplement O&M costs (and/or investment costs). Two principles should govern the development of such supplementary sources:

a) such activities should not distract from the basic O&M activities to be performed, and

vii. It was noted that the largest part of the O&M expenditures is made up of personnel cost and often irrigation schemes are unnecessarily overstaffed. Therefore, the Consultation recommends that:

a) efforts be made to develop standards for the manpower requirements for each of the main jobs to be carried out and that actual situations be compared with the standards;

b) personnel be trained to carry out their duties and responsibilities effectively;

c) farmers be involved in some of the O&M works so as to reduce the personnel requirements.

viii. It was emphasized that satisfactory management is a priority problem but this requires, among other conditions, that adequate financial resources be available. Therefore, it was recommended that.

a) suitable budget allocations be made to irrigation systems so as to enable them to carry out operation and maintenance activities effectively;

b) direct linking of farmers contributions to the O&M budget should be pursued (see section 3.5);

c) if satisfactory levels of operation and maintenance are desired by the irrigation authority, the government should consider supplementing the farmers' payments with equal contributions or any other agreed formula. Farmers generally aim at minimum cost for O&M and this may not be satisfactory in the long run for the upkeep of the system. Such formulae are likely to be more effective when applied in areas which are actually managed by farmers (like tertiary canals) or where they are heavily involved in the process of establishing annual water charges.

ix. The determination of O&M costs of the drainage networks during planning and design stages is a neglected area. There are also conflicts regarding the allocation of costs since generally the areas affected by drainage problems are only a part of the whole irrigation scheme but often caused by those areas located at higher elevations. Therefore, it was recommended that:

a) realistic cost estimates of the operation and maintenance of the drainage networks be developed in feasibility and appraisal studies. For this purpose, the local experience with maintenance has an overriding value in determining the cycles of maintenance and related costs;

b) as drainage problems in low lying areas are often caused by the misuse of irrigation water in the upper parts of the schemes, it seems equitable that related costs be shared by all beneficiaries regardless of their location. This principle should apply not only to O&M expenditures but also to any related invesments.

3.3 Revenue Enhancement

General Statements

i. Policies should move towards a pattern of covering O&M costs from a blend of sources including:

a) direct O&M activities carried out by the farmers,

b) farmers' payments to the organization actually managing the main system facilities,

b) such activities should be based on resources available within the territory of the irrigation system (i.e., fish in the reservoir, water in the canals, trees on the rights-of-way). Use of these resources may be by direct action of the irrigation managers or through "renting" those resources to others.

3.4 Setting Water Charges (levels and structure)

General Propositions

i. In multipurpose hydraulic systems only those costs relevant to irrigation should be considered in the determination of the water charges. However, even irrigation should not be charged with ill-conceived costs created by faulty design, construction, or initial mis-planning.

ii. The goal should be to move toward a level of water charges that covers the full cost of normal O&M, plus the recovery of as much as possible of the capital costs, while leaving a portion of the net incremental income with the water users.

iii. The target farmer share of capital cost recovery should be based on the following considerations:

a) the general structure of macro-economic policies, and the burden or benefit of these policies on the farmers;

b) the extent to which goals other than increasing farmer incomes have increased the total investment costs; and

c) the fact that project benefits and potential incremental incomes are often overevaluated at the planning stages.

iv. In those circumstances where only O&M expenditures are to be recovered from farmers, the irrigation services fees should still take into consideration the farmers' ability to pay as reflected in the incremental net income due to irrigation.

v. Particular attention should be given to the transaction costs (verification, estimation, collection, control system) inherent in setting irrigation water charges, as there is the danger of transaction costs being higher than the amounts collected.

Specific Recommendations

vi. The goal should be to cover the full cost of normal and efficient O&M, with the possible exception of situations where a clearly defined portion of the O&M costs represents an externality imposed by another sector of society.

vii. The water charge should have clearly identified components for O&M and for capital costs. The primary purpose for having components for O&M and recovery of capital cost in water charges is to provide autonomy to the O&M agency, while at the same time giving the farmers additional incentive to cooperate in O&M activities by making them the true owners of the irrigation system.

viii. In principle, the charge should not exceed the typical user's "irrigation-induced ability to pay", defined as net incremental income from irrigation. In practice, the charge should be lower than this "irrigation-induced ability to pay", both to provide a reasonable incentive to the users to engage in irrigated agriculture, and to avoid overcharging large numbers of users whose net incremental incomes are below average. This is particularly important during the years immediately following completion of the irrigation works as during this period the "ability to pay" is much lower than expected for the full development stage. There should be regular monitoring of changes in yields and incomes in project areas.

ix. The special session members were divided on the question of whether consideration should be given to the "socio-economic ability to pay", defined as the difference between net family income and some socially defined threshold family income level (poverty level; critical consumption level). Some felt that if income is below this threshold, either no charge should be levied, or alternatively there should be no charge for capital cost. Others argued that the water charge policy should be separate from general social welfare policy, and that all benefitted farmers should contribute something, even if the amount is small. The distinction is more theoretical than practical as even in the second case the total amount to be collected will be very small and the cost inolved may superior to the revenue collected. Therefore it seems more practical to adopt the first criterion.

x. In situations consisting mostly of state operated pumping schemes, where the charge is based on the volume of water which farmers choose to use, it may be desirable to structure the charge with two components: a charge per unit area (fixed charge) and an additional charge per unit of water (variable charge). This ensures a minimum level of income to the irrigation agency in years when demand for water is low, and also allows the levels of the two components to be set so that the total income to the irrigation agency is adequate to cover its costs, while allowing the variable charge to reflect the marginal cost of water. Because of the increased administrative costs associated with implementing this two-part charge, it would normally be justified only in situations where the total charge for water is relatively high.

xi. To avoid the difficulties of establishing and collecting charges from large numbers of small farmers, arrangements for the bulk sale of water ("water wholesaling") should be considered. Water could be sold on a volumetric basis to an entire group of farmers, with the group taking responsibility for the actual distribution of water among its members, and for the levying and collection of charges from its members to pay both for its local distribution costs, and for the cost of the water purchased from the irrigation agency. To make this work, strong farmer organizations are needed with clearly defined authority and rights to contract for and distribute water, and to collect payment from individual farmers.

xii. Indexing of water charges is desirable to avoid difficulties in periods of inflation. Indexing with a price index may best offset the effects of inflation, but may be difficult for farmers to understand. Linkage with output prices, particularly when most irrigated farmers produce a single crop, may be more acceptable. The method has the advantage of linking increases in charges to changes in the farmers' ability to pay. It can cause problems, however, in times of declining output prices when other prices are constant or rising.

xiii. In setting the structure of charges it may be desirable to differentiate among groups of farms, either to reflect differences in physical or agronomic conditions (e.g. soil texture, crops grown), or to reflect differences in the quality of irrigation or in the costs of providing irrigation (e.g. portions of a system served by pumps vs. areas served by reservoirs). The extent to which charges should be differentiated to reflect these differences needs to be based on the conflicting considerations of the administrative cost of implementation (verifacation, estimation and collection) and the farmers' perceptions of equity. If water charges are administered at a highly centralized level, only a limited degree of differentiation among users will be feasible. More extensive differentiation, and thus greater attention to farmers perceptions of equity, is possible with more decentralization. With more extensive differentiation, there is less danger of overcharging large numbers of farmers (relative to their ability to pay), while at the same time a higher rate of overall cost recovery can be achieved.

xiv. Whether charges should be administratively levied on the owners of the land or on the actual cultivators of the land is an important but complex question. The legal status of landlord and tenant rights needs to be considered as well as the methods and costs of collection and enforcement. For example, if enforcement

procedures involve foreclosure on land, enforcement charges should be levied on the owners, but if enforcement is by termination of water deliveries, charges should be levied on the cultivators.

xv. The Consultation noted that more care is needed in the preparatory phases of new projects. Unrealistic projections of the financial impact of projects on farmers is likely to result in projects in which it is impossible to implement a satisfactorily policy for water charges. Involvement of farmers in these early preparatory phases may reduce this problem.

3.5 Organization Structures and Administrative Development

3.5.1 Organizational structures necessary for irrigation authorities to maintain an accountable relationship between farmers and the water authority

i. The special working group members agreed that a financial link between the management of the system and the farmers is essential to provide incentive for efficient delivery of services. The implication of this conclusion is that revenues collected in a given system for O&M expenditures should be used as far as possible in the same system. Thus schemes having a high percentage of compliance will be rewarded while those with low records of payment will be penalized, but will have the incentive to perform better.

ii. Basically there are three administrative possibilities for the collection of revenues, namely:

a) Revenue collections go to a central finance ministry or treasury and the irrigation agencies obtain an operating budget which bears little relation to the collected revenues. This operating budget may be allocated partially to the system on the basis of:

- collected revenues
- foreseeable expenses (annual budget)
- area basis

Only the first alternative (collected revenues) offers incentives for better management, and where possible is recommended. It seems undesirable that the irrigation agency should get an operating budget which is often unrelated to its overall performance.

b) Revenues are collected by the government irrigation agency and redistributed at the district or scheme level on the basis of the revenue collected and the requested budget. The government tops up the necessary funds to keep the agency operating or, even better, provides a subsidy proportional to the revenue obtained.

c) Revenues are collected by water users' associations and used in the system where they are collected. Governments only complement revenues in the case of calamities or natural disasters.

iii. Apart from situation (c) which is assumed to be desirable but operates in only a few countries, situation (b) represents a feasible transitional arrangement in a long term more from (a) to (c). It has the advantage of decentralizing budgeting and decision making to a point nearer to the distribution system and the farmers. However, the procedure requires a considerable degree of control over the collection of revenues as well as over the expenditures at the project level.

iv. The financial alternatives associated with the collection and redistribution procedure are outlined as follows:

a) Government subsidy is proportional to the revenue generated.

b) Government subsidy tops up the revenues collected.

c) There is a flat government subsidy and a variable revenue.

Only procedures (a) and (c) offer incentives for efficient management of the systems and the irrigation agency.

v. Separation of the O&M department from the construction and design department is often desirable. The O&M department provides continuous services to farmers. There is an urgent need for it to become an autonomous unit selling these services. This would give it power to decide salary levels, bonus systems, and personnel requirements. As long as the O&M department receives its budget from the central treasury it is not important who collects the revenue, and there may be administrative economies in using a revenue department.

3.5.2 The role of water measurement

vi. Water measurement for pricing purposes is needed only in demand systems. In all systems of any degree of complexity in delivery and layout it is needed for operational purposes. Sampling techniques may be used to estimate water consumption of different crops if it is necessary to deliver different amounts for different crops. This system can also be used as a basis of differential charges per ha for different crops, and to influence farmers to choose crops requiring less water.

vii. Irrigation engineers can make systems work smoothly by knowing what amounts of water are going where. This requires measurement and adjustment. Smooth systems do not require pricing policies to ensure that the correct amounts are used by farmers; supply regulation, stabilized delivery and proper timing do this.

3.5.3 The role of government agencies in transferring the management of the systems to farmers

viii. In systems already managed by farmers, government agencies should see their role as providing temporary support to overcome disaster, or to bridge technical limitations, at the request of farmers.

ix. In large systems, once a degree of decentralization to the project level exists and the project managers have some autonomy, it might be possible to have farmer representation on the Board of Directors. But this is less important than the financial link mentioned above.

x. In the short run farmers should be expected to manage only the tertiary level or to the field channel level. The important thing is not to impose on them a uniform, alien mode of organization. According to varying social structures and to the degree of scarcity of water, farmers may prefer to pay a water master, to elect a committee, to act by informal consensus, etc.

xi. The social and technical requirements for transfer of responsibilities relate to the capacity of farmers/organizations to undertake required activities. They must have the knowledge, tools, spare parts, and materials needed to undertake O&M at whatever level. In the long run farmers may develop the capacity to undertake responsibilities, but in large systems the process may never extend beyond the tertiary level without the formation of an independent farmer-owned O&M organization or equivalent.

Paper 1

TRENDS OF IRRIGATION DEVELOPMENT

by

H.M. Horning

It is estimated that 37% of the total world crop value comes from the world's total cultivated land under irrigation, which amounts to only about 14%, and is by no means evenly distributed. About half of the monsoon zones of East Asia, 12.6% of the cultivated land in arid West Asia, and only 3.3% in the whole of Africa is irrigated. East Asia produces 89% of world rice, still the most important irrigation crop, with a high potential for intensification. This explains the high concentration of irrigation in this region.

Irrigation expanded in past decades because of its contribution to increased productivity, but the present decade shows an annual increase of only 1.8% instead of the previous 5%, and in the early 1980s the irrigation share of cultivated land remained static at about 14.5%.

The growth rate of irrigation was about 2.7% in developed countries, but only 1.5% in developing countries. Increased costs of water development schemes and declining prices of agricultural products were probably responsible. Developed countries with high value crops and a high degree of intensification can cope with these constraints, but developing countries need irrigation for staple food production, involving high-cost development and usually requiring external loans not readily forthcoming. Demographic, economic and social factors, availability of land and water resources, and the state of the rural infrastructure all affect irrigation requirements and constraints.

Modern techniques, a fast spread of groundwater development and the shift of investments from the public to the private sector in developed market economies have led to irrigation expansion that has been substantial in real terms even where cultivated areas remained unchanged, or declined.

In the East Asian developing countries, China with 4 million ha and India with 40 million ha share 40% of world irrigation, which accounts for 45% of the production area in China and 40% in India. Both countries use irrigation for the vertical rather than the horizontal expansion of cultivation. Consequently, the total land under cultivation has changed little. Any expansion had to depend on the existing infrastructure, both here and in other countries of the region, and particularly in the island and mountain countries where costs are even higher.

In West Asia, the most extensive arid zone in the world, the irrigation area is only 12.6% of the world total, covering 26.8 million ha - only a quarter of that of East Asia. Although only 31% of the total cultivated area is provided with irrigation it accounts for 70% of the crop value produced.

The past decade saw a decline in both the irrigated and the total cultivated area in this region, the one reduced by 500 000 ha and the other losing about 4 million ha, mainly because of increasing salinity, waterlogging and soil degradation through erosion and desertification. The production index remained far below the world average. Agricultural production per caput remained the same, or in some countries even declined. Because of the high costs and the physical constraints inherent in irrigation, and the fact that modern techniques have not been widely applied, investments tend to be directed towards reclaiming degraded land.

In Africa, 9 million ha under irrigation represents only 5% of the total cultivated area - the lowest in the world. Yet production from irrigation is about 20% of the total crop value. 47% of all the irrigation in Africa is concentrated in the Mediterranean and in the arid North African zone, for demographic and climatic reasons. The Sudano-Sahelian zone accounts for 25%, and Sub-Sahelian Africa has 2.5 million ha under irrigation.

- Because of high aridity, agriculture in North Africa is similar to that of West Asia. Egypt has the highest irrigation dependence in the world - 96% - but its cultivated area is declining at the rate of 40 000 ha per annum, and the production per caput does not keep pace with population growth despite a high level of input use. As no major water developments are possible at present, reclamation, water saving techniques and groundwater development must be given priority.

African food crises and droughts raise the question of the role of irrigation in providing a solution, and a recent FAO consultation on irrigation in Africa has put forward some guidelines:

- Large irrigation perimeters are justifiable where irrigation can compete with non-irrigated production.

- Irrigation is suitable as the sole form of farming where cultivation is impossible without it (arid zones).

- Irrigation can complement rainfed farming when it enables intensification of crop production, introduction of new crops and opening of new markets (semi-arid areas).

- Supplementary irrigation can assist particular crops (humid and semi-humid zones).

- Irrigation and other forms of land reclamation may be used as a socioeconomic stabilizing factor in rural development, to settle the population, improve living standards and satisfy food needs.

- Irrigation should preferably form part of a wider-ranging area development programme, which should overcome the economic, social and institutional constraints.

- Farmers' involvement in all stages, and the transfer of responsibilities to farmers and water users' associations is indispensable for success.

Irrigation problems in Latin America are similar to those of the rest of the developing world. In Mexico, as in East Asia, irrigation is expanding within the well developed infrastructure, but is at a standstill in the arid zone west of the Andes because of high costs and the need to divert limited funding to deal with salinization.

The unprecedented decline in the availability of funds in the developing countries means that their allocation is determined on a cost-effectiveness basis. This requirement has led to two main trends in irrigation:

- reduction of costs and of the public share of investments in irrigation development, and

- intensification of production under irrigaton.

Only lower-cost projects have been adopted for horizontal expansion of irrigation. Where such projects did not exist, priority has been given to vertical expansion of irrigated production through intensification rather than by increasing the irrigated area.

The present discussion on water pricing policies must consider both trends, as such policies should be founded in harmony with, and in support of, these trends.

Paper 2

APPROACHES TO FINANCING IRRIGATION

by

Ian Carruthers

Irrigation must compete for resources with alternative investments and services. Although there are several sources of finance the three main ones examined in the paper are foreign loans and grants, general tax revenues and user fees.

In the current financial climate, in mixed economy and socialist countries alike, there is a dominant theme to economic policy which can be summed up as "Get the Prices Right" (GTPR). This puts emphasis on user fees, but there are limits to the degree these can be set, depending upon progress with GTPR elsewhere in the economy.

If agriculture suffers adverse domestic terms of trade because of an overvalued exchange rate, or if other public services such as electricity, water and telephone are heavily subsidised, there are limits to the adjustment of irrigation user fees. Adjustment of user fees to reflect the real costs to farmers, or to raise revenue to feed into the irrigation operation and maintenance budget, is severely limited if such distortions are widespread. In the general move to GTPR, political and economic assessments of indirect costs to farmers and their position via-à-vis other groups is extremely relevant.

The paper therefore advocates a move towards increased user fees as part of macro-economic management policies, in line with general progress of financial and economic reform in the economy. A graphical analysis is presented in the paper to illustrate revenue implications of alternative pricing policies. Attention is drawn to the lack of information on collection costs. At low levels of fees these can represent a high proportion of revenue and may exceed it.

The paper concludes that in the current widespread public sector financial crisis, raising revenue is a more important goal than hitherto. A comparison is made of direct water charges, betterment levies, land tax, agricultural product taxes and price controls, using recent reviews of field experience.

A call is made for higher direct charges, indexed against inflation, and where possible earmarked to the department or even to the particular scheme from which the fees are drawn. Problems in implementing this are discussed. Particular attention is given to the rapidly developing problem, in rice economies, of depressed market conditions for paddy following large shifts in the supply curve of paddy farmers. Increasing charges at a time of falling main product prices is not politically easy.

The paper recognizes the many aspects of the irrigation financing problem as primarily political and administrative. The technical and economic arguments are not reaching the politicians and the political constraints do not filter down to technicians. An improved dialogue is necessary.

A hierarchy of criteria for assessing irrigation systems prior to setting charges is suggested: profitability of farming; manageability of systems; financial availability for O&M; adequate and reliable water charges. This leads to specification of a "virtuous cycle" of profitable agriculture, good revenue performance, good O&M adequate and reliable irrigation support and administrative detail. The paper stresses that the rehabilitation phase provides an opportunity to make detailed plans in collaboration with farmers to get this cycle rolling.

Paper 3

EFFECT OF WATER CHARGES ON THE ECONOMIC AND TECHNICAL EFFICIENCY OF IRRIGATION SYSTEMS

by

Allen LeBaron and
Jack Keller

This paper takes it for granted that any interest society in general (the taxpayer) has in "efficient" use of irrigation water is due to some broad desire for "high output per unit of water applied to crops", i.e. that the controlled and conveyed water be put to beneficial use.

Farmers are observed to use all the irrigation water they can lay their hands on. This observation naturally leads to the assumption that they would be more careful if they had to pay more for access to the resource, and consequently to the belief that imposing some form of charge on farmers for water will increase irrigation water use efficiency (implying physical efficiency in this case).

The paper is concludes that this belief is a myth: water charges will not have any meaningful effect in achieving society's productivity goal.

What role might fees have on use of irrigation water at the field level?

1. If a farmer is short of water he will use what he receives as best he can. Thus no pricing policy is necessary to make him efficient. In this case, where water is a scarce resource, it is obvious that a charge might very well reduce use, but whether the social result would be positive would depend on whether the "saved" water could be used beneficially somewhere else.

2. If a farmer has an excess supply of water, any amount not used by plants (i.e. "waste") will reappear in the local water basin hydrograph and might be re-used elsewhere. All the potential efficiency, in a basin sense, will still be obtained per unit of water. If there is no other use for the water, it makes no difference to society (on efficiency grounds) whether fees are levied or not.

3. Whether or not water deliveries can be measured by the unit is immaterial to this argument.

   Unit water prices, or some hybrid system might have a direct impact on preventing water from entering a "perimeter" if the fees are imposed or increased. The physical arrangement of individual systems will determine what the result implies for society's goal of beneficial use.

4. If the farmers inside a project perimeter take less as a group, "saved" water will presumably be beneficially used elsewhere, otherwise society would not care, on efficiency grounds, about the quantity diverted from the project by the fees levied. Fees, alone, will not have contributed to any net gain in general beneficial use.

5. If the system in question includes some storage possibilities, the location of a short-term beneficial use alternative might be in a reservoir. But this possibility does not mean that volumetric or other pricing has accomplished anything by way of water use efficiency that could not have been achieved directly through reservoir management. Indeed, in the long run and in normal circumstances, the managers might have to let the reservoir spill, in which case the analysis reverts to paragraph (1).

6. The most firmly pursued element of the whole irrigation fee efficiency myth is that charges will be effective in pumping situations. This belief might also be incorrect. The only certainty is that the fee can stop water entering the

perimeter, i.e. keep it from coming out of the wellhead. Once it is past this point it is the same as water passing through any metered tap: who knows what happens to it and how beneficially it is used? This means that a society paying for irrigation works (or granting and protecting competitive water rights) might be less concerned about what crosses a perimeter; it is interested in what water crosses the root zone. Unless society can be assured that the farmers' intentions for field application are transmitted 1:1 to running the pump, then just where the volumetric charges concern a pumping scene must be spelled out and effects then analysed.

7. A very definite distinction must be made between the water entering a general perimeter and "efficiency" of use in field applications. (This point gives no consideration to conveyance losses).

If our thinking remains focussed on the perimeter, but we now imagine that there are no volumetric or hybrid measurements involved in whatever charges are levied, what can be said?:

8. The farmers pay some fees, but the water deliveries to the perimeter are affected only by what the system managers or nature decide.

9. If there is a shortage of water, paragraph (1) applies.

10. If there is an excess of water, paragraph (2) applies.

The purpose of the main text is to work out all of the above conclusions in detail.

The last section of the paper, entitled "micro economics of field irrigation", is to some extent a repetition of the whole argument, expressed in different words. However, it is something more than a simple repetition, because some interesting additional results are noted, at least in the traditional upland crop irrigation situation:

11. It is profitable for a traditional method farmer not to be highly efficient with his water supply, especially if we think of an "excess" supply in terms of moving toward maximizing crop response relative to that supply. Precision irrigation by hand is extremely expensive in terms of labour time and farmers cannot afford it, especially for low value crops (data for wheat production in India's Maharashtra State are used in the main text).

12. It is also more profitable for a water-short farmer not to concentrate his water on a small part of his land in order to try to obtain the maximum output from the land/water combination. He will benefit more by aiming at a high output in relation to the constrained resource, water. Technical efficiency is defined slightly differently in this case than in (11).

13. In the case of a constrained resource, maximizing makes sense to economists, but it differs from what agronomists mean when they speak of maximum yields vs. optimum available water supply. The agronomists' definition applies in the excess water situation and vice versa. Therefore, from a societal standpoint, and the way economists think about scarcity, higher irrigation water benefits accrue to the economy if water is "stretched" inside per meters. This stretching is accomplished by system managements; no water charges of any kind are necessary to attain the beneficial use results.

14. The most interesting point in the Maharashtra data is that, within the traditional upland cropping framework, the farmer has little or no incentive to invest in precision irrigation, and this is true both for the farmer with excess supply and for the farmer with short supply.

Briefly, if farmers are short of water they do not need water prices to make them be careful with its use in the field. If there is a surplus of water, who cares about "efficiency"? Q.E.D.

The other dimension to charging for irrigation water involves cost recovery. Many thoughts need to be untangled when discussing this topic. The most important philosophic issues revolve around the point that if irrigation were really profitable, one way or another private enterprise would underwrite development and exploitation. The paper does not go into this arena; a few guideline examples about fee collection and subsidy levels are included.

One participant wanted to know where his agency could get the data to make net profits estimates (such as shown in the last section of the paper), because the managers want to work on the calculation of water charges. The speaker stated that although some searching had been needed in order to prepare the paper, the required data should much become easier to find in future.

It was suggested that the title of the paper be altered to reflect the fact that the technical as well as the economic meaning of "efficiency" is covered.

Paper 4

OPERATION AND MAINTENANCE COSTS

by

Juan A. Sagardoy

The paper starts by reviewing the concept of Operation and Maintenance Costs, concluding that the term is often used loosely and that costs reported under this heading have quite different components in many instances. It is therefore important to describe the irrigation works and activities covered by these costs. There seems to be a need for standarizing the terminology associated with these costs in order to make them comparable.

A breakdown of O&M expenditures under fixed and variable indicates that fixed costs are by far the major component (often exceeding 60% of the total costs). Hence, charging water by volume may have only a limited impact in reducing overall expenditure, as a reduction in the water consumption will bring a reduction only in the variable costs, which are just a small part of the total (except in the case where water is pumped and the variable costs are much higher).

The notion seems to have spread that substantially increasing the water rates will automatically result in a better operation and maintenance service and thus the overall performance of the scheme will improve. Although it is recognized that suitable operation and maintenance services require considerable higher water rates than those existing in many instances, there is no guarantee that these higher rates will automatically improve the operation and mainentance and the overall performance. In other words, increased water rates are often necessary but must be accompanied by suitable institutional changes and improved management capabilities in order to upgrade the standards of the O&M Service.

A number of additional measures or services are often needed, particularly in the early years of the life of an irrigation scheme, to guarantee its proper functioning. The financial implications of these additional services cannot be ignored. In fact, the paper strongly argues that in new irrigation schemes, in addition to efficient operation and maintenance services, other necessary services should be provided, such as an agriculture department to give advice to farmers in irrigated agriculture; a social service to encourage the establishment of water users' organizations; mechanization, fertilizers, credit and other services to help poorer farmers to develop a progressive irrigated agriculture. The costs of these additional services are not necessarily high. If the services are successful in promoting a more intensive agriculture the corresponding charge can be easily paid by farmers.

The paper emphasizes that, before attempting to increase the water rates, serious consideration must be given to the possibilities of reducing actual operation and maintenance costs. This is often a much more viable alternative than trying to increase rates in an indiscriminated manner. In order to visualize some of these possibilites the paper analyses the influence of the different components of the operation and maintenance costs and their corresponding weight in some selected cases. This analysis has revealed that personnel costs are by far the largest component, often exceeding 65%. Overstaffing is common in many irrigation schemes. Hence, in many instances there seems to be a good opportunity to reduce costs by reducing the staff. The energy component in pumping irrigation schemes can also be a very important component (61 to 73%). Therefore, the importance of reducing consumption by having a highly efficient system of distribution and controlling the water application cannot be overemphasized.

The importance of delegating some management responsibilities to farmers is another aspect that can have a considerable influence in reducing operation and maintenance costs. Farmers tend to be more cost concious than the civil servants, and at the same time, the public expenditure can be reduced considerably as a part of the costs will be borne directly by the farmers. This is evidenced by an example from Indonesia where it is shown that delegating the management of tertiary canals to farmers can represent a reduction of more than 30% in the operation and maintenance costs.

Another factor than usually receives scant attention is the generation of revenues from non-irrigation activities that may contribute to finance irrigation costs, for instance: fish production in ponds, canals, and irrigation fields can be a profitable undertaking. In addition, the generation of energy, and other activities, can be equally important.

Lastly, the paper analyses the impact of operation and maintenance costs on the farmers' income and concludes that there are many instances in which certain crops cannot stand high operation and maintenance costs without reducing that income or even creating a negative income. Therefore, the criterion that is often put forward that operation and maintenance costs should always be recoverd from farmers cannot be applied indiscriminately without having a close look at the impact of such costs on the income generated by the crops under different types of farming. This is a leading criterion in establishing water charges. The analysis also shows that highly profitable crops, like vegetables, are hardly affected by irrigation costs. Therefore, any variation in such costs will have hardly any effect in improving the efficient use of water as the farmer's budget is only affected to a very small degree. The paper finally argues that water charges by hectare rather than by volune may be an acceptable compromise in schemes where there are crops consuming large amounts of water (rice, sugar cane) and others consuming little water (vegetables). In these circumstances, the charge per hectare may reduce the burden on crops having a reduced net benefit but a large water consumption, and have the opposite effect on crops like vegetables which have low water requirements but generate a substantial net income.

Paper 5

COST RECOVERY IN IRRIGATION PROJECTS: PERCEPTIONS FROM WORLD BANK OPERATIONS EVALUATION

by

Paul Duane

INTRODUCTION

The Bank's Operations Evaluation Department is responsible for evaluating the Bank's development experience, and recently produced a report entitled: "World Bank Lending Conditionality: A review of Cost Recovery in Irrigation Projects", dated June 25, 1986. The findings of this report form the basis of this paper.

OED STUDY FINDINGS

There were very few instances of Bank-assisted projects where significant capital cost was recovered. This means that for each of the 48 projects studied, if all revenues from direct charges were compared with what it cost to operate and maintain each project, there were very few cases where revenues exceeded operation and maintenance costs and made any significant contribution to the recovery of capital costs.

Direct charges for irrigation water include any charge per unit of water, per ha of land irrigated, whether crop specific or not, or any special irrigation tax such as a betterment levy.

A few words about Bank policy. Most of the 48 projects examined had been approved before 1976, when Bank policy was revised somewhat. Before that, policy was relatively simple. It required "recovery of operation and maintenance costs as a minimum, and of investment costs to the extent practicable"... by direct charges.

In legal agreements related to bank loans for these irrigation projects, this policy - expressed in something like the above language - appeared as a clause or covenant. Hence, the OED report often lists its findings in terms of the degree of borrower/country compliance with these covenants.

It is worth noting that borrowers were mostly in compliance regarding investment cost recovery because the covenant language was so vague: the convenants called for recovery of investment costs "...to the extent practicable" or "... as much as possible...". But the essential observation here is that there was virtually no capital cost recovery.

With regard to recovery of other costs, in at least two-thirds of the projects reviewed, the covenant requiring that direct charges recover operation and maintenance costs was not fulfilled. In only about 15% of the cases were the covenant provisions fully met. Recovery rates through direct water charges ranged from zero to 100% of operation and maintenance costs, and a large number were in the range of 15 to 45%.

In other words, if any of the 48 bank-financed irrigation schemes were selected at random, direct charges would be unlikely to show a recovery of even one-half of the operation and maintenance costs.

It seems clear that the Bank's cost recovery policy which influenced covenants up to 1976 has encountered difficulties because borrowers generally failed to comply wich the covenants. More seriously, cost recovery - as defined - is certainly deficient among developing country borrowers from the Bank.

Relations between Operation and Maintenance Cost Recovery and Operation and Maintenance

If performance of cost recovery was poor, what of performance of operation and maintenance? Operation and maintenance was considered satisfactory at audit in only

about half the projects. The question arises as to whether there is an association between the degree to which covenants were adhered to, in particular those relating to recovering operation and maintenance costs, and the extent to which operation and maintenance was satisfactory. Of 36 cases where this could be checked, 16 had bad adherence and bad operation and maintenance and 7 had good adherence and good operation and maintenance. Although this showed that two-thirds of the projects had evidence of an expected association, somewhat surprisingly nearly one-third had bad compliance and good operation and maintenance. Nevertheless, it is worth noting that there were frequent reports that farmers were reluctant to pay charges when the irrigation service was not dependable. Cases were reported in virtually every region of the world in which poor operation and maintenance was cited as providing a ready excuse for farmers not to pay realistic charges willingly. Moreover, when operation and maintenance is bad, government is weakened in its attempts to enforce payment.

Projects in several countries illustrated the problem of poor operations, involving inequitable distribution of water and lack of responsibility on the part of irrigation engineers for delivering planned discharges to every outlet. Individual project evaluation reports tended to automatically relate the level of operation and maintenance to water charge collection. However, when the water charge collections go to the general revenue fund, such a direct correlation is not necessarily valid and is seldom justified.

Although there was evidence of an association between recovery of operation and maintenance costs and operation and maintenance standards, the report could not establish any clear proof of cause and effect. As a matter of judgement, however, the report concludes that good operation and maintenance is probably necessary for good cost recovery.

This paper attempts to explain why, in the past, the Bank appeared to emphasize the need for cost recovery as a prerequisite for good operation and maintenance. This is probably a result of the Bank's early approach to cost recovery, which was heavily influenced by its thinking about authorities supplying public utilities such as electricity, water for domestic use, etc., which were expected to be self-sustained by commercial revenues. It was considered that institutional arrangements for this type of agency should require that all costs be recovered.

Causes of Poor Cost Recovery

The report identifies three main reasons why cost recovery covenants have been insufficiently observed: (i) lack of government commitment; (ii) poor operation and maintenance of the irrigation system, and (iii) the heavy burden of direct and indirect taxes collected by governments from farmers as a result of price distortions within the economy as a whole. The second cause has already been discussed.

Government Commitment. The lack of government commitment with respect to cost recovery was noted in a number of projects. Although officials repeatedly expressed recognition, at project completion, of the importance of improving cost recovery from beneficiaries, the issue remained a very sensitive political matter. Many government agencies have neglected to pressure farmers on cost recovery because they count on government appropriations rather than water charges to finance their operational budget, and hence have no direct financial incentives. But note also the extremely interesting comments of one of the major borrowers from the Bank. The Government of India, commenting on the OED Cost Recovery Study, stated first that it did not expect irrigation projects to generate revenues or recover costs to ensure project sustainability after completion; irrigation projects were regarded as part of the government's development program and were not expected to be self-sustaining. Second, since most irrigation projects were targetted towards the rural poor, water charges were not intended for the purpose of recovering costs and were a function only of the farmer's capacity to pay.

I think that Bank policy has to come to terms with situations where the country is clearly opposed either to direct chargs or to substantial recoveries by direct charges. Strictly speaking, "recovery" is no problem in these circumstances. Presumably it is covered by General Revenue. However, the nature of the problem is transformed, involving the allocation of these general revenue funds for irrigation.

Heavy Burden of Price Distortions. The issue of farmer incentives to utilize the irrigation supplies made available by the projects emerged time and again. There were several cases where farmers were paying a sizeable implicit tax (i.e., the difference between farmgate prices and the higher border price equivalent) by having to sell their products at low prices because of government control or export taxes (although the report also recognizes that such a general tax compensates the public sector not only for the cost of irrigation water but for other important services as well).

In Mexico, for instance, the price distortion amounted to an implicit tax of 20 to 50% of the value of the project commodities, and in Sri Lanka the indirect taxes were up to 10 times higher than the water charges. These examples demonstrate that the Bank's emphasis on direct cost recovery, without proper consideration of implicit tax and indirect recovery mechanisms, was inappropriate. The report observes that alternative cost recovery approaches besides direct water charges are possible. These include taxes of various types. In some instances commodity price controls have a direct impact on cost recovery from the farmers. However, these aspects have often been ignored in the Bank's application of its policy.

Again, I have included some personal comments on these questions. I agree that there are circumstances when we must recognize export taxes (on rice in Thailand?) or statutory low domestic crop prices (for rice in Indonesia?) as forms of cost recovery (although some price distortions do not lead to government revenue), if a government refuses to levy direct charges. Ultimately, the question as to whether governments levy direct charges or use export taxes or other general revenue for cost recovery is political.

The Bank and other agencies might state their preferred means of recovery, but in the end, if export taxes etc. are used, how is cost recovery actually measured? For various reasons, I believe that once one moves away from direct charges, the accounting gets very complicated, and if there is any merit in measuring cost recovery through a specific type of general tax, it should be done within a very general framework. For example, these are general taxes; they recover other public costs as well as public irrigation costs.

Finally, another topic I refer to briefly in my remarks at the beginning of the paper comes under the heading: "Should Irrigation Agencies be Organized as Public Utilities?. To make the point more strongly, should governments organize their irrigation agencies in such a way that the responsibility for financing everything - capital and operation and maintenance costs - is passed downwards, at every step, from the agency to the farmers? This sounds a good idea if we want to take direct charges seriously. But to make it a Bank policy, the Bank would also have to find a government that is willing to adopt the policy. This is a good illustration of the political dimension of cost recovery. In this context, and in many others involving water charges, I would like to advocate specific field experimentation, with some of the ideas that are generated at conferences like this one, to demonstrate what is feasible.

Paper 6

THE AID APPROACH TO IRRIGATION RECURRENT COSTS: A MIX OF INSTITUTIONAL ALTERNATIVES

by

Joan S. Atherton

The paper reviews the United States Agency for International Development's (AID) policy and programme with respect to coverage of recurrent costs in irrigation. It is not limited to water charges, because that is only one of a number of mechanisms AID designs into its projects to address the problem of operation and maintenance (O&M) on irrigation schemes. The paper summarizes the findings of a series of ex-post impact evaluations, states the policy position with respect to recurrent costs and analyses 40 project designs in terms of their consistency with the policy guidance. It also summarizes the findings of two recent studies of recurrent costs based on country case material.

The evaluation findings are inconsistent in their attention to recurrent cost considerations in early AID project designs. However, improved water management has been an AID concern since the mid 1970s for reasons of economic efficiency if not financial viability.

In 1982, AID issued a recurrent costs policy statement, discouraging the payment of recurrent costs for any country project unless four conditions were met:

- the host country policy framework must be acceptable in terms of revenue generation, resource allocation and macro-economic policies, or such a framework must at least be envisaged;
- an analysis must have been made to assure that recurrent costs support has a higher development impact than new investments;
- the host country must be shown to be unable to undertake recurrent cost financing; and
- a carefully phased plan must have been developed to shift the entire recurrent cost burden to the host government over time.

With respect to the analysis of project designs, there appears to be a trend toward increased AID effort to address the sustainability problems of irrigation projects by dealing directly with operations and maintenance issues in this period since the 1982 policy paper was published, although, to be fair, a substantial number of the projects that pre-dated the policy statement contained some activity that was at least partially aimed at the recurrent cost problem. The positive trend with respect to this issue is in part attributable to the fact that host countries have now begun to make serious efforts to attend to operations and maintenance problems, as a result of the straitened financial circumstances in which they find themselves in the 1980s.

A great deal of AID's project designs are still focussed on improving water management, but that improvement is now explicitly linked to the ability of irrigation systems to be self-sustaining, both financially and otherwise. The emphasis on sustainability has led AID to support institutional development from the national governments to the farm level, in a range of organizational forms and in an interdisciplinary manner. Although covenants with a host country to impose or raise water charges may be part of the project design, it is likely to include elements of technical assistance, training, organizational development, community organization, and/or studies of the legal and administrative measures needed for decentralization as well.

Finally, the paper cautions that the analysis of AID's irrigation project portfolio was limited to a study of the designs, and that projects are often changed substantially in implementation. It indicates that AID as an institution appears to have absorbed the need to design action elements into its projects to ensure sustainability, but it is less clear that field implementors and host country policymakers are able and willing to follow through.

Paper 7

RESOURCE MOBILIZATION IN FARMER-MANAGED IRRIGATION SYSTEMS: NEEDS AND LESSONS

by

E. Walter Coward Jr. and
Edward Martin

This paper is concerned with farmer-managed irrigation systems (FMIS) - small systems under the control of private farmer groups and outside the orbit of the state systems. Two questions are posed: (1) what public policies regarding assistance to FMIS are needed to ensure continued strong farmer commitment to mobilizing the resources required for operating and improving their systems, and (2) what can be learned from an understanding of the processes of resource mobilization in FMIS that might be applied in the context of state systems so as to increase farmer contributions to system operation and development costs?

FMIS represent a segment of the irrigation sector that can contribute significantly to natural production and income goals with little direct dependence on the national budget. A prime public policy objective in irrigation development should be to assist these FMIS, as required, while supporting their continued autonomy and self-financing. Three principles help define such a process: (1) FMIS should have a lead in identifying their priority needs, with technical support in considering options provided by the agency; (2) external resources, with some provisions for repayment, should be used to match locally mobilized resources, and control over these external resources should at least be shared with the FMIS; and (3) there should be no ambiguities regarding water rights for the FMIS and control of the system by the FMIS following completion of the external assistance.

A review of resource mobilization processes in FMIS suggests the following four generalizations: (1) resource mobilization is carried out in the context of control of overall system operation; (2) resources are mobilized for specific jobs rather than for a general fund; (3) resources are mobilized in direct relation to each person's water rights and thus have the advantage of being fair; and (4) FMIS have the capacity to mobilize resources not only for system repair and maintenance but for key processes such as water distribution.

The effective increase of farmer-mobilized resources to replace some government-provided resources in public irrigation systems can only be accomplished in the context of several new policies and procedures for implementing irrigation development. These include:

- improving the design process to eliminate "unproductive, irrelevant and extravagant" facilities;

- bureaucratic re-orientation that gives more emphasis to main system management, and encourages greater dialogue and engagement with water users;

- significant farmer involvement in the key processes of water acquisition, allocation and distribution;

- creating local organizations as a means for and result of ordering farmer activities in support of system operation and resource mobilization, and

- identifying new financial procedures that link agency actions and farmer payments more closely.

Paper 8

WATER CHARGES: A TOOL FOR IMPROVED IRRIGATION PERFORMANCE?

by

Leslie E. Small

An important reason for imposing direct charges on the users of irrigation water is to encourage the improvement of irrigation performance. The improvement in performance could result from (a) increased funding for operations and maintenance (O&M); (b) improved accountability of system managers to the water users; (c) better cooperation and involvement of water users in O&M; (d) increased efficiency of water use by farmers; and (e) better investment decisions.

But the likelihood of water charges leading to these effects depends on whether they are imposed within an institutional framework fostering a degree of financial autonomy for the irrigation agency, or whether the institutional framework places the agency in a position of financial dependence on government budget allocations. If a significant degree of financial autonomy prevails, the irrigation agency will have control over the funds collected from the water users, and will thereby also have a significant degree of control over the funds allocated to irrigation O&M. This creates financial responsibilities and linkages that may lead to improvements in irrigation performance. In the absence of financial autonomy, it is unlikely that water charges will have any positive effect on irrigation performance.

Financial autonomy usually involves decentralized responsibility for irrigation services, as is the case in China, Korea, Japan, Taiwan, France, Greece, Mexico and the USA. An example of centralized financial autonomy can be found in the Philippines, where a semi-governmental corporation is responsible for constructing and operating national irrigation systems throughout the country.

Financially autonomous irrigation organizations generally impose direct water charges for O&M services, and in some cases for a portion of capital costs. However, to reduce the level of direct water charges which must be imposed, they frequently earn secondary income from a variety of economic activities in which the agency engages, or from assets which it owns.

Although the benefits of financial autonomy appear substantial, it is not a simple matter to introduce the institutional changes necessary to create autonomy. Efforts to do so are likely to lead to a transitional stage in which many organizational and financial problems will be encountered, but there is a continuum between absolute financial dependence and complete financial autonomy. Movements in the direction of autonomy, where possible, seem desirable.

One argument against financial autonomy is that farmers cannot afford to pay the water charges that would be necessary to cover the costs of O&M. But considering the large amounts which farmers using non-government irrigation facilities frequently pay for water, this argument needs to be examined very critically. If water charges are a key link in a chain of events needed to improve irrigation performance, then charging farmers for irrigation may ultimately prove to be a way of increasing their income.

Paper 9

IRRIGATION SYSTEM RECURRENT COST RECOVERY; A PRAGMATIC APPROACH

by

Mark Svendsen

There is a very interesting and exciting convergence of thinking taking place at this expert consultation on several key ideas. Moreover, a number of these ideas run counter to prevailing World Bank and USAID policy on recurrent costs. After a construction boom in the sixties and seventies, the pace of new irrigation development has slowed markedly. This leaves many governments with an expanded irrigation infrastructure which must be maintained and operated to remain productive, resulting in heavy recurrent cost burdens on country governments.

A growing recognition of the magnitude of these burdens, coupled with lower overall economic growth rates, is creating a climate of greater receptiveness in a number of countries to changes in existing water charge policies. Such changes will need to be more fundamental than in the past and will require considerable experimentation and flexibility in implementation.

Traditional approaches to the problem of recurrent cost recovery have usually employed a macro-economic approach and have relied on pricing theory to recommend increases in water fees.

A macro-economic approach usually relates water charges to three goals: efficiency in resource (water) allocation, equity among socioeconomic groups, and financial cost recovery. It seems clear, however, that increasing water charges has virtually no impact on farmer behaviour regarding water use -that is, on economic efficiency of resource use. This is because such a relationship depends almost entirely on farmers being able to secure measured quantities of water on request -which is very seldom the case in major irrigated areas of the developing world.

In the case of equity among socioeconomic groups within an irrigation system, it is possible to postulate areas which might be responsive to pricing effects. However the extent of such impacts is generally quite small and there are more effective tools, such as land reform or general property taxes, for achieving them. Financial goals are much easier to assess in relation to an irrigation fee policy, and the problems involved consequently receive increasing attention from governments in many countries. However, even when the goal is financial, the following six problems remain to be solved.

First, fee levels are not revenue levels. Revenue levels depend on collection rates which are often significantly less than 100 percent. In many cases they are less than 50 percent.

Second, the fees collected become general revenues. Once turned over to the treasury they are subject to standard budgetary processes and usually do not affect the level of the irrigation agency's budget.

Third, for similar reasons, when irrigation agency personnel are responsible for collection of fees, there is little incentive for them to do this efficiently.

Fourth, the costs of collecting the fees may be substantial and are usually ignored. It is net revenue that is important in meeting the financial objective. Although there is little data on the magnitude of these costs, one study in Bihar state in India shows that costs of collecting fees amounted to 84 percent of the collections in 1981/82.

Fifth, O&M budgets are highly vulnerable to general budgetary cutbacks. Since they are often on of the first things cut, they are likely to be even more volatile than fee collections.

Lastly, traditional fee policies have little or no impact on irrigation system performance. This has been discussed in other papers and I will say only that there are two fundamental pillars of reform.

The first is the devolution of O&M responsibility, wherever possible, to farmers themselves. By reducing O&M costs in this way, the need for revenues is reduced. The second is a realignment of the financial path connecting users with the irrigation agency to make it direct. Making the agency directly dependent on the revenues it collects from its users creates a situation of interdependency and accountability, provides a strong incentive for the irrigation agency to be efficient in system operations (as well as fee collection) and increases its understanding of farmers' interests and behaviour.

Finally, the contention that simply increasing the budget of an irrigation agency will result in improved system operations and maintenance should be very carefully examined. There is little evidence to support this notion, and given the dominant position of salaries in most O&M budgets, there is some reason to be sceptical. Many systems lack an appropriate model for improving operational efficiency, and the common remedies of "increasing staff levels" and "training" are often ineffective in improving irrigation performance.

Paper 10

COST RECOVERY FOR THE LEZIRIA GRANDE PROJECT: A CASE STUDY OF A REHABILITATION PROJECT IN PORTUGAL

by

C. de Jong and L.H. Sprey

In the context of the Lezíria Grande Rehabilitation Project in Portugal an attempt was made to design a repayment system that would result in equitable sharing of project benefits between society and the direct beneficiaries in different income classes.

The design of an equitable cost recovery system requires the information collected for a normal feasibility study together with details concerning the size and distribution of the project rents and income distribution in the project area.

Despite the rather modest internal rate of return of the proposed project (10 percent) and the use of the farmers' repayment capacity (which is only part of the project rent) as a basis for cost recovery, there appears to be ample room for full cost recovery of O&M and capital investment, provided that the projected results are valid.

As the farmer has to change agricultural practices, thus incurring extra risk, the compensation and incentive required is estimated at 10 to 20 percent of the project rent. Furthermore, as the project rents of a group of farmers are distributed according to an average, but in fairly homogeneous groups, most farmers will generate a project rent of at least 60 to 70 percent of the average. The repayment capacity of a fairly homogeneous group of farmers is thus assessed at only 50 percent of the average project rent.

Aggregation of groups will reduce this 50 percent because of the higher variability in project rents within the aggregated (and more heterogeneous) group.

In fixing the chargeable amount for various groups of farmers their farm income must also be taken into consideration. Farmers with an income below the critical consumption level have a repayment capacity of zero.

As in the Lezíria project rents appeared to differ considerably throughout the area, the imposition of a uniform charge that would enable a high rate of cost recovery was not possible. The division of various groups of farmers according to the soil types of their farms allowed the repayment capacity (= the chargeable amount) of each of these groups to be set at a higher percentage of the project rent, thus enabling a high rate of cost recovery.

However, differentiation of rates according to soil and farm type requires decentralization in water administration and a fairly high administrative capability at project level.

Since the assessment of the farmers' repayment capacity is based on arbitrary assumptions, the validity of these assumptions has to be tested in practice and their values adjusted accordingly. For this, monitoring of farmers' performance is necessary.

The farmers' willingness to pay the charges for cost recovery and those for operating and maintaining the system can be improved by involving them in the preparation of the project.

To reduce inequities between irrigation projects in the country and to permit replicability of investments, indexing of charges is necessary.

Paper 11

THE DOMINANCE OF THE INTERNAL RATE OF RETURN AS A PLANNING CRITERION AND THE TREATMENT OF O&M COSTS IN FEASIBILITY STUDIES

by

Mary Tiffen

The report presented the results of a study of 50 evaluations of irrigation schemes funded by different agencies. The objective was to make recommendations to improve planning and preparation studies, both for new schemes and for major rehabilitations. The latter often provided an opportunity to revise irrigation charges.

During the analysis and in discussions with consultants and funding agency personnel, it emerged clearly that the importance of showing a high IRR acted as a constraint on the physical and institutional design and on the implementation strategy. Yet the IRR had considerable drawbacks, including the discounting of recurrent costs. This meant that projects were essentially designed to minimize initial construction costs and gave insufficient attention to sustainability. The IRR was not a guide to sustainability, partly because of the inherent difficulty in predicting future outcome, and partly because of manipulation. The IRR at project completion often differed markedly from that estimated at appraisal, and still more from later estimates calculated after some years of operation, when the results of poor maintenance might show up in the few instances where this kind of figure was available.

Analysis of the results of the evaluations showed the crucial importance for sustainability of adequate farmer incomes to ensure that the infrastructure was used, and of adequate resources to maintain it. These matters were not emphasized sufficiently in World Bank guidelines for the preparation of irrigation feasibility studies, but were much more central in guidelines in use in developed countries, prepared by USBR and the OECD. Resources for O&M are linked to farm incomes since farmers can only pay O&M charges if they make enough profit.

If achieving a high farm income and a financially viable project authority able to carry out adequate O&M becomes a more important criterion for project design, design solutions adopted will be different from those enforced by the need to get high IRR. An example was given of a rehabilitation and extension design which used imported pumps instead of a gravity canal that could be repaired with local resources, and which failed to consider whether two smaller schemes might be more easily managed by farmers, with savings to government, than one large and less manageable scheme. The view of the farmers as potential scheme managers had not been sought.

Paper 12

FINANCING IRRIGATION PROGRAMMES IN THE PHILIPPINES

by

María Concepción J. Cruz and Wilfrido D. Cruz

An evaluation of existing irrigation water pricing policies of the National Irrigation Administration (NIA) of the Philippines is focussed on the recent policy of the Philippine government of requiring NIA to recover the full costs of irrigation construction and operation. This paper maintains that this approach to water charges is rational on the basis of increasing the pool of financial resources for new irrigation developments, and rehabilitation of existing systems, spreading the benefits derived from public investments in irrigation, and providing incentives for more efficient use of water through greater water use accountability. However, this policy raises the question of whether there is, in fact, a case for subsidizing irrigation programmes.

The declining priority for irrigation is reflected in the distribution of irrigation investments in relation to the total national budget. This decreased from 5.4% in 1979 to 3.3% in 1983. In addition fees collected from water users have remained low compared to the total costs of NIA operations. As a percentage of O&M costs, for example, irrigation fees fell short by as much as P35 per hectare in 1983.

The NIA charges a uniform irrigation fee of 100 kg/hectare in the wet season and 150 kg/hectare in the dry season. These rates, however, vary by system; for example, the Upper Pampanga River Project charges a higher rate of 125 kg/hectare and 175 kg/hectare in the wet and dry seasons respectively, due to the higher cost of construction and O&M.

Since 1979, irrigation fees contributed about 20% to 30% of the yearly income of NIA. Collection rates have also improved from 68% in 1979 to over 70% in 1983. Several approaches are currently used by NIA to further improve collection rates, such as the creation of monetary incentives to NIA personnel and farmers' groups and the enforcement of the "lateral turnover scheme".

We argue, however, that the problem is not low fee collection but whether such fees are justified. Part III suggests that since positive externalities arise from irrigation investments, society must share in the recovery of cost.

We also propose that a distinction be made between O&M costs which are long-term, and thereby capital-maintaining, and O&M costs which enter the current production cycle.

A practical alternative system of irrigation charges is proposed. The primary consideration should be the capacity-to-pay of water users, since many irrigated farm households had incomes which were below the poverty threshold in 1984. The secondary consideration is the sustaining of current levels of irrigation operations by ensuring that enough funds are available for operating and maintaining existing irrigation systems. Water users should be charged the short-term O&M costs, and by making them pay for these costs, the additional advantage of making water users' associations accountable for maintaining the system facilities will be achieved.

Paper 13

IRRIGATION WATER CHARGES AND RECURRENT COST RECOVERY IN PAKISTAN

by

Muhammad A. Chaudhry

Agricultural development in Pakistan depends heavily on irrigation. The main sources of irrigation water are surface water and groundwater. The irrigation systemn of Pakistan is facing a number of economic, financial and technical problems. Heading the list of these problems is inadequate operation and maintenance. The ability to carry out maintenance is inhibited to some degree by financial constraints.

The system is not financially self-supportive mainly because the water charges are very low. They are levied on an acreage basis, constituting a very small fraction of cash production costs, and have no accurate relation to yield values. In other words, the present level and structure of water charges does not provide meaningful economic signals to farmers. Irrigation subsidies are also very high, and the major portion of these subsidies goes towards O&M of public tubewell schemes. In order to make the system financially self-supportive, a necessary condition for efficient O&M, water charges need to be increased.

The next question is: can farmers afford to pay increased water charges? The crop/farm income analysis indicates that there is considerable scope for increasing the existing water charges. However, at this stage the government, despite its commitment to international lending agencies, is not prepared to increase the water charges, mainly for political reasons.

Pakistan's Public Tubewell Schemes (SCARPs) are now recognized as the world's most expensive and costly vertical tubewell drainage programme. It is a well documented fact that increasing O&M investments in SCARP tubewells, given current management inefficiencies, can neither be justified on benefit grounds nor on a cost recovery basis. The government has therefore decided to abandon these schemes. However, whether anyone would be willing to buy these notoriously inefficient units is questionable. A frequent cause for concern is that there seems to be a big contradiction in macro-level policy objectives. On the one hand, investment is being made to abandon these inefficient schemes while on the other hand new units are being installed in some areas.

Due to the presence of certain illicit practices in the current assessment method, considerable sums are misappropriated. In order to eliminate these financial leakages, implementation of flat rate pricing policy is recommended. Apart from low water charges, methodological deficiencies in present budgeting procedures also contribute to inadequate budgets for O&M spending. The annual O&M budget is presently prepared on the basis of a "yardstick model" which was developed decades ago. The model requires updating and flexible application so that the effects of various economic and technological changes are effectively captured in the form of improved O&M budgeting.

SOME ADDITIONAL ISSUES

Governments are generally reluctant to make frequent revisions in water charges, mainly for political reasons. It is therefore necessary to find a permanent solution to the problem. In a country like Pakistan where output prices are revised quite frequently, indexation of water charges to the output prices can be considered as an alternative method.

It is generally felt that the best time to increase the water charges is immediately after rehabilitation. This may not be true. It is important to convince the farmers of the benefits of rehabilitation before an increase in water charges can be considered. In the Pakistani context the economics of rehabilitation needs some immediate answers.

In project agreement papers, covenants regarding water charges are defined in a very vague manner. This leads to a situation where water charges are considered as the only source of funds required to meet the costs of improved O&M services. Should not the structure of various types of taxes be analysed in detail to see whether part of these taxes can be utilized for supporting the costs of improved O&M services?

Paper 14

WHY SOME FARMERS DO NOT PAY WATER CHARGES

by

Eliseu Alves de Andrade

The paper stresses two points. The first point is that irrigation is necessary to sustain the growth of Brazilian agriculture. The area presently irrigated is 2 million hectares, of this, 0.07 are public and 1.93 million hectares private. The government decided, for the period 1986-1991, to increase the irrigated area by 3 million hectares. The Northeast region will benefit from 1 million hectares and 2 million hectares are contemplated for the other regions of the country. Public irrigation presently exists only in the Northeast region, and represents up to 20 percent of the programme.

The second point is that the lack of payment of water charges is a consequence of the fact that farmers failed as producers. In other words, they were unable to generate enough income to pay these water charges. Failures of payment are in the range of 30 percent of the farmers in the CODEVASF case.

The reasons indicated as responsible for the fact that the farmers are failing as producers were the following:

i. Lack of recognition that there is a training period during which they cannot generate enough income to pay water charges. The length of the training period varies from farmer to farmer and depends on the quality of the extension service.

ii. There is an excess of paternalism on the part of government. CODEVASF is freeing its eighteen irrigation perimeters by handing over their management to the farmers, and intends to do the same with the new perimeters right from the beginning. The farmers will therefore assume the responsibilities of management as soon as the perimeters start functioning, and will be organized so that they are capable of taking over.

iii. Irrigation is a sophisticated type of technology. The extension agents are not sufficiently trained to accomplish their mission, and research is equally inadequate.

iv. There are drainage deficiencies. Credit is insufficient and not available when needed. Marketing needs to be improved. However, even if all these causes which contribute to the failure to pay water charges had been removed, the result would still have been negligible, as the farmers themselves were not in a position to take advantage of improved conditions. Therefore, the prerequisite for success in irrigation is to train the farmers to handle the new technology.

Transfer to farmer-management of the existing public perimeters, and farmer-management of the new perimeters as soon as these are put into operation, is considered to be the best way of relieving government of the political problems associated with irrigation. Furthermore, the main role of government is to create conditions which will stimulate private irrigation throughout the entire range of small and large farmers.

Paper 15

IRRIGATION WATER CHARGES IN CHINA

by

Xu Guohua

China has a long tradition of collecting irrigation water charges. Many irrigation schemes have been operated successfully using finance mainly based on income from this source. The Dujiangyan and Jinwei Canals are two successful examples.

From 1982, China started to reform water charges. Many provinces and autonomous regions have raised their rate of water charges with some success. It is reported that when the water conservancy agency receives more income, the water is used more economically. However, even the best results are still far from the final goal, i.e. to increase the water charge rate to cover the full cost of water supplied.

Water charge reform, in fact, represents part of a fundamental ideological change. Irrigation projects used to be considered as public welfare, but now the government considers them as a business enterprise, like factories, mines, etc. The water they supply is a commodity, and water users are the purchasers and must pay the full costs. This seems quite straightforward and reasonable. However, there are still many questions to be answered. One of the questions is the proper treatment of the share of investment "owned" by farmers. As a rule, in China only the headworks and main canals are built by government. Even here, almost all the labour involved is contributed by local farmers. Thus government and farmers are both shareowners. Although the farmers' share is not counted in calculating the amortization of investment recovery, it has to be counted in amortization of the funds for system rehabilitation. Now a subsidiary question arises: one of the two "part-owners" starts to ask the other "part-owner" for money, and the more the farmers contributed in construction, the more they have to pay. That is to say, no allowance is made for any previous contribution. The higher the labour component, the higher the charge levied as a percentage of non-labour costs, which seems strange to many people.

The water charge reform will improve matters, but most people do not believe that it can achieve its final goal within a short period, and even if goals are achieved in some places, there will still be quite a large number of irrigation schemes left to be subsidized by government. In Gansu Province, for example, many schemes use water pumped up even more than 700 m high. In these difficult areas, government is obliged to subsidize farmers. To subsidize irrigation is perhaps preferable to other kinds of subsidies. But in these areas the subsidy will probably take the "open" form rather than the low water charge.

It is believed that around 2% of the gross value of the main crop in the area concerned is the optimum level of water charge. A range of 3 to 5% is acceptable. Anything above that is considered too high, except in certain special cases where 10% is acceptable, at least temporarily.

It is believed that the combined system is the best method of calculating the water charge. A basic charge is a kind of charge the farmers have to pay whether the irrigation service is actually used or not. Normally the water management organization of the scheme will tell farmers how much water can be used in irrigation that year. Then farmers pay the basic charge and buy water tickets according to the amount they need. They pay half of the sum in advance. At the time of irrigation, water is delivered according to the sum paid with the water ticket. After the harvest, farmers pay the other half of the water charge. If they do not pay the basic charge and/or do not buy water tickets in advance, they will receive no water for their land during the current year. If they do not pay the other half of the charge they get no water for their land the following year. This seems a good method of collecting the water charge. It should be pointed out that, throughout these operations the irrigation management organization always deals with the persons who represent villages, never with

individual farmers. The amount of water is actually measured at the main canal. However, it is basically by estimation in lower canals, as long as the total sum of water volumes of all villages meets the amount measured at the upper level canal (of course, it should be multiplied by an efficiency coefficient - 0.4-0.6 is generally used. This seems effective.

From now on, China's main effort in irrigation will be to increase the water use efficiency as well as the irrigation benefit. The expansion of the irrigated area will still continue, but on a smaller scale and at a lower rate. A 1% annual increase will be the most we can expect.

Paper 16

SHORT REPORT ON COST OF IRRIGATION WATER AND IRRIGATION WATER CHARGES IN SOME ARAB COUNTRIES

by

Abdullah Arar

The paper reviewed the cost of irrigation water in several Arab countries. This cost ranged from 2 US cents/m³ in Saudi Arabia to about 19 US cents/m³ in Libya for underground water from deep wells. The cost of water from surface irrigation systems in three Arab Countries, namely Egypt, Jordan and Morocco ws also discussed. The following is a summary of the existing situation of the cost of irrigation water and the price that farmers pay for such water.

EGYPT

In Egypt the cost of surface water in the old lands is estimated at about 0.4 US cents/m³, while water from the Jongle's canal project will cost about 5 US cents/m³. The cost of irrigation water from deep wells, such as the New Valley is estimated to vary between 3 to 6 US cents/m³. Farmers in Egypt pay no direct charge for irrigation water but they are responsible for the maintenance of the last common irrigation canal. In addition, the agricultural sector in Egypt is a net subsidizer to the rest of the economy. It is estimated that in 1975 the Egyptian consumer received a net subsidy of about US$ 460 million from the agricultural sector.

JORDAN

The paper discussed a unique project in Jordan (East Ghore Canal Project) where water is measured at the head of each farm unit (size of farm unit ranges between 3 to 5 ha) and farmers are charged about 0.86 US cents/m³. This rate is not an insignificant charge, as it is equivalent to US$ 86/ha/m or US$ 10.5/acre/foot. Nevertheless, it falls short of covering the operation and maintenance cost which is 7 to 10 times higher (6 to 10 US cents/m³). The paper discusses briefly the reasons behind this high cost of operation and maintenance in the East Ghore Canal Project, and points out that the Jordan Valley Authority intends to increase water charges over a period of time until they cover the operation and maintenance costs, but this is politically difficult.

The paper also compared the actual cost of irrigation water in five projects in Jordan with the charge made to farmers for the water. In four projects, the farmers are charged only 10 to 40 percent of the actual cost (heavily subsidized), and in one project only, the users are paying a small margin of profit. In this case, the users are government organizations, i.e., Agaba Municipality and Ministry of Agriculture.

MOROCCO

In Morocco, irrigation water charges are about 2.8 US cents/m³, while the cost of energy alone is about 1.4 US cents/m³ and the operation and maintenance cost ranges from 9 to 11 US cents/m³. Some case studies indicate that water charges are about 38 percent of its production and delivery cost.

The paper concluded with the following two statements:

i. In principle, the total cost of irrigation water is the summation of capital investment and the operation and maintenance costs of irrigation systems. In the case of multipurpose structures, such as large dams, only a part of the cost of such structures should be allocated to irrigation and a part to other uses, such as power generation and flood control. Some even argue that such multipurpose structures should be considered as a public service, such as roads or schools, and that the cost should be borne by the nation as a whole.

ii. It is recognised that while water supply is a social and economic necessity to the community as a whole, the amount consumed varies widely with different activities. Thus the practice is to support part of the cost of water by general taxes and part by revenues from users. Farming in particular (the highest consumer of water) has always been favoured in receiving water at low costs because of the important super-structure of business and commerce which derives from the agriculture structure, but which consumes little water itself. Hence in the countries under review, i.e., Egypt, Jordan and Morocco, irrigation water is either provided free or heavily subsidized.

Paper 17

IRRIGATION WATER CHARGE PRACTICES IN NIGERIA

by

J.A. Akinola

Nigeria, with a population of about 100 million, is blessed with a vast land mass of 98.3 million ha, of which 72.4% (71.2 million ha) is cultivable. The enormous land mass has given rise to vagaries of weather, with rainfall variation of 3000 mm to 500 mm from the southern coastal areas to the extreme north.

Because of this uneven distribution of rainfall in space and time, severe and prolonged droughts are frequent. In an attempt to obviate the devastating effect of drought, government has evolved a policy on crop irrigation. Shadouf irrigation has been the traditional method in practice along the banks of perennial rivers, for vegetable production. This method is labour intensive. To date more than 805 000 ha (1978 figure) has been put under irrigation. The formal large irrigation schemes financed and managed by government have covered only 50 000 ha even though more than 1 million ha was planned for completion in the recently terminated Fourth National Development Plan. Although the government embarked on a number of agricultural programmes to sensitize the people into agricultual production, even big-time farmers (individuals and companies) avoided venturing into this area of economic activity because of the high capital outlay and long gestation period of such irrigation projects.

Government has not formulated any policy for financing irrigation investments in either public or private irrigation schemes. All existing large schemes are wholly financed by government, including operation and maintenance.

Government has not formulated any policy on recovery of investment costs. Irrigation projects are treated as social welfare schemes. The agencies responsible for these large schemes - the River Basin Development Authorities (RBDAs) - are empowered under an enabling decree to charge fees for services provided to farmers, including the supplying of water. Such charges for water generally vary between N15 - N100 per hectare of irrigated land. If all costs of investments were to be recovered from these large irrigation projects, a sum ranging from N800 -N2000 per hectare would need to be charged.

At present no permission or licence is needed and no charges are imposed on the surface or groundwater exploitation and abstraction. A water legislation which will give legal backing to government has been formulated, and is in the process of being enacted.

Nigeria has no financial policies specifically to stimulate irrigation investments by private individuals or groups, but there are some established financial policies for agriculture as a whole which also include irrigation. These established policies include an Agricultural Credit Guarantee Scheme, whereby banks must set aside 15% of their loan portfolio for agriculture, and commercial banks must operate low interest rates for agriculture, while a Nigerian Agricultural and Credit Bank (NACB) is to be set up for agricultural promotion.

There is no existing policy on operation and maintenance of public irrigation schemes, but a policy is being formulated for the government to bear the cost of headworks and irrigation infrastructure while operation and maintenance costs are to be borne by the farmer-beneficiaries.

Operation and maintenance costs in Nigeria would be between N200 and N600/ha depending on the irrigation methods used.

Most farmers in government-financed irrigation schemes could produce double cropping crops of 7 ton/ha. With the current domestic market price of rice, a handsome income of about N700/ha is possible. Allowing for cost of production, the recovery of the cost of operation and maintenance would not constitute any problem.

Farmers benefit from subsidies on other agricultural imputs as well as from tax relief. As they also pay only taken water charges, the total of the fee they have to pay is insignificant.

In conclusion, for water charges or cost recovery on irrigation to have impact in most developing countries, policies, solutions and recommendations should take into account the following:

a. the structure of the government

b. the agency (federal, state, local or private) responsible for implementation, operation and maintenance

c. the sources of revenue for the country

d. economic circumstances of the country

e. multi-objective water resources development (economic, social and political)

   In most developing countries, political and social considerations outweigh all other objectives

f. availability of the water for irrigation.

Paper 18

IRRIGATION WATER CHARGES IN TUNISIA
THE CASE OF THE OASES OF SOUTH TUNISIA

by

Habib Essid

Agricultural land covers about 5 million hectares, of which only 5% are at present irrigated (250 000 hectares). 50% are irrigated from surface water (dams, river pumping stations) and the remainder from underground water (shallow dug wells, deep drilled wells). Public irrigation schemes cover about 70% of the total irrigated land in Tunisia. The main system used is flood irrigation, but in the last ten years about 30 000 ha have been put under sprinkler and 500 ha under drip irrigation.

PUBLIC POLICY REGARDING THE FINANCING OF IRRIGATION INVESTMENTS

Private Irrigation Schemes

There are two types:

- Small farms (up to 10 ha). They are usually irrigated either from shallow dug wells or river pumping stations. In this case the investments are financed through the special fund for agricultural development (15% grant, 70% as a credit with a rate of interest of 7.5% and payback period of 7 years with 2 years grace).

- Large farms and private companies. The investments are financed through the normal banking system, with specific tax advantages and a subsidized rate of interest (8.5%).

Public Schemes

- North and central regions: the investments are financed by the government, but the farmers have to pay a betterment levy that should be collected through the taxing system. A maximum and a minimum size of the farm within the irrigated perimeter is also defined. There is a special government agency (ARAPI) which is in charge of the transactions both inside and outside the irrigated perimeters.

- Southern regions: the investment cost of public irrigation schemes is not recovered in this area.

PRESENT POLICY WITH REGARD TO O&M EXPENDITURES

The government policy is that water users should pay a water charge which at least covers the O&M expenditures.

Actually the private schemes pay for their O&M expenditures, but get a small subsidy through the subsidized fuel and electricity prices (10%).

For the public irrigation schemes the O&M costs are at present subsidized by the government (50%). The water charges are collected by the water agency which is responsible for the O&M of the system. The money collected by the water agency is used to balance its own budget, so that the agency is directly interested in collecting the water charges. In the present situation about 90% of the fees are actually collected by the water agency.

RECOMMENDATIONS

- Continue to increase the water charges gradually in order to cover all the O&M expenditures.

- For the time being, include within the investment cost of the public irrigation scheme the cost of spare parts and of training the staff for the maintenance of the system for the first five to ten years in order to help the water agency to do the maintenance work until the water fees increase to cover the O&M expenditures.

- Design the irrigation system in such a way that it could be turned over to farmers for its operation in a first phase and its O&M in a second phase.

- Farmers should participate in the designing of the irrigation system in order to make them understand what is being done and for what they will be paying.

Paper 19

IRRIGATION WATER CHARGES IN CYPRUS

by

Nicos Tsiourtis

Cyprus has a serious water deficit problem which, combined with the high cost of water development, makes it necessary to make a charge for water delivered to the farm gate. The charges applied in money terms per cubic metre help to collect the necessary amount for the financing of the O&M costs and at the same time contribute to the proper and efficient utilization of the available water. The water charge does not cover the full cost of the water, but according to the existing law it can go up to 40 percent, and in special cases up to 65 percent of the total cost which includes amortization, interest, O&M and works insurance costs.

In Cyprus there are two types of public irrigation schemes: (1) the government waterworks, planned, designed, constructed and managed by the government which later sells water and collects the charges, and (2) the Irrigation Division Projects which are designed and constructed by the government but are managed by the farmer-beneficiaries. Capital cost financing for the government projects is provided by the government from government funds (tax or loans) and the project belongs to the government which is responsible for the management, operation and maintenance. The water from these projects is sold to the farmers at a charge fixed by the Council of Ministers and ratified by parliament. Irrigation Division capital cost financing is provided by the government with 2/3 as an aid grant and 1/3 in the form of a long-term, low interest loan payable in 22 years, with three years' grace. The work belongs to the ID which undertakes its operation, bearing the total cost plus 1/3 of the maintenance cost. The distribution systems in almost all cases are pressurized closed conduits with high conveyance and distribution efficiencies which oblige the farmers to irrigate with high irrigation-efficiency systems such as sprinkler, drop, mini-sprinklers, etc., distributing the water to the farm gates "on demand" or "on rotation".

Paper 20

IRRIGATION WATER PRICING IN ZIMBABWE

by

G.D. Mudimu

INTRODUCTION

The Zimbabwe Government attaches great importance to irrigation development as a means of enhancing and stabilizing crop production which is affected considerably by unreliable seasonal rainfall and periodic droughts.

Approximately 150 000 hectares are irrigated per year.

The Ministry of Energy and Water Resources is responsible for water resources development and currently supplies 369 10^6 m^3 of water for irrigation. The annual unit cost of supplying water ranges from Z$18 to Z$633 per 10^3 m^3, depending on size of dam or borehole. The Ministry of Energy and Water Resources supplies water to the field energy of irrigation schemes.

Private commercial farming accounts for 82% of the land under irrigation. Government financed schemes account for 18%; the parastatal farming organization - the Agricultural and Rural Development Authority (ARDA) - is responsible for about 11 000 hectares. There are 74 irrigation schemes in the communal areas. Some are managed by the government extension department (AGRITEX) and others by farmers themselves. There are also some schemes that are under farmer ownership although they are serviced by government.

Schemes established since 1980 have been initiated as part of the land resettlement programme started in 1980. Some schemes in the communal subsector are termed "economic" schemes, referring to the fact that irrigators are expected to derive their living from irrigated crops. Supplementary irrigation schemes are designed to augment dryland crop production.

Surface water use and distribution is governed by the Water Act. Riparian owners must obtain a water right for abstraction of riverflow for irrigation purposes. The cost of a water right is the application fee, which is Z$10.50.

It is government policy that all water consumers pay for the capital and O&M costs of water supplies. The O&M are calculated at 1% of the total capital costs.

In public schemes, the cost of water supply to field edge is and has been considered in the past, as a government grant, with the exception of ARDA which has to pay full costs.

In the past the water charge to cover investment and O&M was determined as:

$$\text{water charge} = \frac{\text{Amortized Capital Costs + O\&M}}{\text{Total Water Available for Supply to all Consumers}}$$

) of major capital
) works and con-
) veyance

The current proposal is to have a blend price calculated as follows:

$$\text{Unit cost of water} = \frac{\text{Summation of Amortized Capital Costs + O\&M for all Existing Dams (i.e. public dams)}}{\text{Summation of live yield of water from all Existing Public Dams}}$$

Two blend prices are being suggested; one for the high rainfall areas where irrigation is needed for supplementary purposes only and the other for the dry parts of the country where viable crop production may depend entirely on irrigation. The water

charge for the higher rainfall regions would be higher than that for the other regions. This methodology introduces some elements of cross-subsidization. The other issue is that, with the commissioning of newly-constructed dams, the blend price must be revised upwards.

With respect to O&M within public schemes, prior to 1983, irrigators paid water charges based on crop value, nature of water circulation rotation, and on whether or not a scheme or part thereof was lined. The payment ranged from Z$6/ha for schemes with a water circulation of 15 days or more to Z$35/ha for schemes of 10-14 days circulation, and Z$70/ha for a 10 day water circulation scheme. These were charges for all year cropping, i.e. summer and winter crops.

To improve water discipline and provide incentives for increased production as well as to ensure that farmers in the same scheme pay uniform charges, a new payment structure based on gross margin and water security of a scheme was introduced in 1983. Water charges for all-year cropping were raised to Z$145/ha.

Water charges levied in public schemes are for within scheme maintenance and operations costs. They cover only 15-20% of actual O&M. The balance represents government subsidies. However, government is exploring means of reducing subsidies, such as having farmers manage their own schemes, including the proposal to base O&M recovery on net farm profitability.

It is estimated that irrigators in public schemes earn twice what dryland farmers in the same agro-ecological conditions earn, which means that farmers are in a position to pay.

To encourage private commercial farmers to invest in irrigation, government has established a National Irrigation Fund worth Z$18 million from which farmers can borrow at reduced interest rates of 9.5% instead of 13-18% charged by commercial banks. Six million dollars of this money is earmarked for rehabilitation and development of irrigation schemes in the communal sector.

RECOMMENDATIONS

- Farmers must contribute to recovery of water resources including O&M costs.
- The water charges must be related to the farmers' ability to pay.
- A uniform rate should be levied for all water users with subsidies for those farmers in irrigation schemes that need government support to be viable.

Paper 21

IRRIGATION WATER CHARGES IN MEXICO

by

A. Olaiz Perez

Mexico has about 5.6 million hectares under irrigation, with large-scale irrigation schemes - Irrigation Districts - representing 60% of the total. Irrigation Units, or small-scale systems account for 32% and the remaining 8% consists of Private Irrigation Schemes. The systems are operated respectively by the state, the direct users and private owners.

Basic grains and products are the predominant national crops (corn, wheat, beans, rice, soya, sorghum, cotton, sugar-cane, saffron, sesame, etc.) and have guarantee prices which are frequently the ceiling prices. About 50% of the total export value of agricultural Products comes from the irrigated areas, and includes tomatoes, cucumbers, green peppers, etc., produced mainly in the Irrigation Districts of north and northwest Mexico.

It is estimated that between 1988 and 1990 a total area of 8.5 million ha will need to be irrigated to meet demand and guarantee food production sufficiency. Investments have been made mainly in rehabilitation programmes to recover past and higher productivity levels, as this is cheaper, per hectare, than new works.

In the past, most systems were financed totally by the public sector, but today the participation of direct users has increased. A relevant law (Law of Contributions for Betterment of Public Works of Hydraulic Infrastructure) establishes that direct users of new state-built systems shall contribute 90% of the recoverable value of the works over a period of 15 years, with a down payment of 10% of that value in the first year. Interest rates on payments are determined by fiscal regulations.

Direct subsidies vary according to the type, scale, location and potential users of the services. Pumped irrigation is not subsidized in irrigation districts, while gravity systems are aided by state resources, subject to the law already mentioned. Investments in irrigation units scattered throughout the country are subsidized because of their social and local development factors. The present tendency is to combine federal, state and private resources to finance irrigation works.

The "Betterment Law" regulates the direct recovery of irrigation investments and establishes that the resources obtained be assigned to new works or to rehabilitation programmes.

Another law (Rights Federal Law) provides for payments for the abstraction of water, a new concept in Mexico, but considered as one of the four components of the price of water. Annual revisions and adjustments are made according to socio-economic conditions, etc. As a component of the price of water it is considered to be uniform and so low as to be almost symbolic. Payment is consistent with the principle of making every water user contribute to the cost.

There appears to be no recent analysis comparing public and private irrigation schemes. The latter are generally regarded as more efficient and economical, but in Mexico public systems are not owned, operated and exploited by public personnel. Although the systems are constructed mostly by the public sector, the land and water rights belong to the registered users and producers.

The present overall policy is for irrigation users to pay the total O&M costs of irrigation systems, while the public sector, namely the Secretary of Agriculture and Water Resources, is responsible for administration of the infrastructure, collecting water charges and applying the resources to operation and maintenance costs. The Rights Federal Law regulates these activities. Small-scale units are directly administered by their respective users' associations.

Types of water charges are usually by volume delivered or by irrigated hectare and amounts vary according to individual circumstances. Government subsidies go mainly to the less developed irrigation districts. The Rights Federal Law determines annual percentages of O&M cost recovery, which may be 60, 80 or 100% according to the size of the district and the average farm size, with some adjustments for exceptional conditions (rainfall, plagues, etc.). More sophisticated projects mean higher irrigation costs. Costs of dams are part of investment costs, but their operation and maintenance are considered as O&M costs. Income from energy is separately managed by the Energy Commission, though some of the common costs are included in the irrigation costs.

Farmers' ability to pay water charges varies significantly and is difficult to estimate. Cost production statistics were mainly available for the more prosperous, advanced farmers who had higher production costs, whereas production values were mostly related to the average figures of the irrigation unit, which led to a general underestimation of the real ability to pay. Furthermore, any analysis rapidly becomes obsolete because of the country's changing economic and financial situation.

However, figures for 1976 to 1981 show a real ability to pay. Water charges for most crops averaged 1% to 3% during the crop growing period. Again, these figures need revising in the light of rocketing Bank interest rates (about 90% simple annual interest and more than 14% with compound interest). Some inputs are produced and distributed by the public sector at low cost among farmers with low resources. Others buy from private suppliers at regular commercial prices, or import the inputs they need, mainly from the USA.

A recent preferential tax policy has favoured farmers producing food and primary goods, and has to some extent offset low income coming from low guarantee prices.

Water charges are aimed at water use efficiency and a fair distribution of costs, and are insignificant in the case of high value crops. They may affect income in the case of low value crops, and here the question of charges and possible subsidies needs careful consideration.

The paper concludes that policies regarding water charges and the instruments for their implementation are clearly defined, but that considerable time and effort still need to be devoted to this subject.

On the other hand, real costs of irrigation are increasing more rapidly than prices for agricultural commodities, and direct users and farmers must contribute more to covering the total costs so that the present infrastructure can be adequately operated and maintained, and can be expanded to reach regions and farmers who do not yet benefit from it.

Paper 22

IRRIGATION WATER CHARGES IN PERU

by

C. Alberto Sarría

Peru has a territory of 128 million ha with a potential arable land of 7.6 million ha (6%) but uses only about 3 million ha (2.1%). This leaves room for a potential increase of 4.6 million ha. Almost 40% of the cultivated land is under irrigation. 58% of this land is located on the coast, 35% in the highlands and only 3% in the jungle.

In the past, most of the agricultural investment was concentrated on irrigation (80%) on four large projects located on the coast. In 1981, these projects absorbed almost 82% of the total budget, and only 5% was allocated to small irrigation projects. This was increased to 15% in 1983, following new tendencies.

At present a government Water Commission is trying to establish a National Irrigation Plan where the small projects in the highlands will have priority, especially in the micro-regions and in the Andes trapezium area.

During the past 15 years, it was impossible to apply the water law of 1969 uniformly because of agrarian problems, a difficult economic situation, and negative terms of trade in the agricultural sector. Nevertheless, water distribution was reasonable satisfactory. On the contrary, the water pricing system stipulated by the Tariff Regulation of 1981 was not successful. The public investment recuperation policy did not work, and the transfer of operation and maintenance to water users' associations failed to obtain the expected results. The main problems were the level of the water price, the low level of collection, reduced budgets for O&M, and the low quality of the irrigation infrastructure.

The Government Water Commission has just reformulated the Water Tariff Regulation in an attempt to solve all the problems mentioned.

Whatever is accepted as a measure of irrigation performance, the Water Commission believe that the potential for improvement of existing and planned irrigation systems may be enhanced through improved cost recovery and by greater farmers' participation in management.

The main recommendation of the present paper is that government give special emphasis to better utilization of existing irrigation systems and resources rather than to irrigation development. Lack of funds and advances in agricultural technology to increase production are encouraging a switch from increasing cropped area to increasing yield per hectare, so that investments must be redirected toward improvements in physical infrastructure and water use efficiency.

Paper 23

IRRIGATION WATER CHARGES IN JAMAICA

by

Thorant W. Hardware

INTRODUCTION

The best and most extensive agricultural land as well as the majority of the population are found on the southern coastal plains of Jamaica. There is insufficient water on the plains to meet the domestic and irrigation demand. Saline intrusion - the result of localized overabstraction - has further limited the availability of good quality water.

Approximately 40 500 hectares or 12.1% of the island's cultivated lands are irrigated. Of the irrigated lands 70% are under sugarcane, followed by bananas and pasturage with about 10% each.

The predominant method of irrigation is surface irrigation employing furrows. The sprinkler and drip systems are used to a limited extent.

Some 60% of the irrigated lands are served by private systems, 39% by public systems and 1% by a semi-public system.

There are no immediate plans for establishing new irrigation systems. However, there are active projects for major improvement and rehabilitation of the systems in the two principal irrigated areas of the island. These systems comprise approximately 85% of the irrigated area.

FINANCING OF INVESTMENTS

Financing of irrigation investments in the public irrigation schemes is twofold: (i) where the funds required are large and require special loan financing and (ii) where the funds required are much smaller and may be accommodated within the national capital budget. Loans through the banking system provide funds for private irrigators. A subsidy of J$5.00 per long ton of sugarcane produced is paid by the Sugar Industry Authority to cane producers who pump water from their private irrigation system.

IRRIGATION WATER COSTS AND CHARGES

A 1985 FAO-commissioned study reported that:

i. the total O&M costs for a gravity supply system was US$ 0.20 per cubic metre;

ii. the total O&M costs for a pumped system varied from US$ 1.80 to $ 3.60 per cubic metre.

A close inspection of the data reveals that personnel costs account for 71% of the cost of the gravity supply system and some 13 to 23% for the pumped systems. However, energy charges increase from 6% for the gravity system to 70% for the pumped system.

The present water charge is calculated at US$ 0.03 per cubic metre for the gravity system and varies from US$ 0.08 to $ 0.13 for the pumped systems.

COLLECTION OF WATER CHARGES

The farmers enter into contracts with the irrigation authorities and are billed quarterly. Payment of water dues is made to the local Collector of Taxes who then

remits the dues to the authority. This arrangement seems to work. The exception is the Rio Cobre Irrigation Works which is not an authority but a government department.

TOWARDS A NEW IRRIGATION WATER PRICING POLICY

The Government of Jamaica seems fully committed to the introduction of sn irrigation water pricing policy. Consideration is being given to the following:

- recovering the full cost of water from users. The required increases are to be phased over a five-year period;

- while initially the water charges would not include any elements of the capital costs, the long-term objective should be to recover the costs of improvement and additions to the various schemes;

- the cost of water could be recovered in two ways (i) a rate per acre which reflects the fixed costs of operating the system regardless of how much water is supplied; and (ii) water dues per unit of water supplied and this reflects the cost of pumping and distributing a unit of water;

- rates and dues charged should reflect the cost of each particular scheme.

ANNEX 1

AGENDA

The Joint FAO/AID Expert Consultation on
Irrigation Water Charges
22-26 September 1986
FAO, Rome

Monday, 22 September 1986

Chairperson Morning Session: Mr. P. Dieleman

09:00-10:00 Registration

10:00-10:30 Opening of Workshop

Welcome Address by Mr. G.M. Higgins, Director Land and Water Development Division (FAO)

Welcome Address by Ms. J. Atherton, Senior Advisor for Rural Institutions (AID).

10:30-11:30 Background Paper: Irrigation Development and Water Charges, by Mr. H.M. Horning. Invited speaker (former Director, Land and Water Development Division, FAO)

11:30-12:30 Background Paper: Approaches to Financing Irrigation, by Mr. I. Carruthers, Professor of Agrarian Development, Wye College (University of London, UK)

Chairperson Afternoon Session: Mr. N.S. Peabody III

14:00-14:45 Background Paper: Effect of Water Charges on Irrigation System Efficiency, by Mr. A. LeBaron, Professor Resources Economics and Mr. J. Keller, Professor Irrigation Engineering (Utah State University, Logan, USA)

14:45-15:30 Background Paper: Operation and Maintenance Costs, by Mr. J.A. Sagardoy, Senior Technical Officer, Land and Water Development Division (FAO)

15:45-16:30 Background Paper: Cost Recovery in Irrigation Projects: Perceptions from World Bank Operations Evaluation, by Mr. P. Duane, Senior Evaluation Officer, Operations Evaluation Department (World Bank)

16:30-17:15 Background Paper: Institutional Mechanisms for the Application of Water Charges, by Ms. J. Atherton (AID)

Tuesday, 23 September 1986

Chairperson Morning Session: Mr. N. Tsiourtis

08:45-09:30 Background Paper: Resource Mobilization in Farmer-Managed Irrigation Systems: Needs and Lessons, by Mr. W. Coward, Professor, Department of Rural Sociology (Cornell University, Ithaca, N.Y., USA) and E. Martin (International Irrigation Management Institute)

09:30-10:15 Background Paper: Water Charges: A Tool for Improving Irrigation Performance, by Mr. L.E. Small, Associated Professor of Agricultural Economics, Rutgers University, USA (International Irrigation Management Institute, Sri Lanka)

10:30-11:15 Background Paper: Irrigation System Recurrent Cost Recovery: A Pragmatic Approach, by Mr. Mark Svendsen, Research Fellow (International Food Policy Research Institute, Washington, USA)

11:15-12:00 Background Paper: Cost Recovery for the Lezíria Grande Project: a case study of a rehabilitation project in Portugal, by Mr. C. de Jong and Mr. L.H. Sprey (International Institute for Land Reclamation and Improvement, Wageningen, Netherlands)

Chairperson Afternoon Session: Ms J. Atherton

13:30-14:15 Background Paper: The Dominance of the Internal Rate of Return as a Planning Criterion and the Treatment of O&M Costs in Feasibility Studies, by Ms. Mary Tiffen (Overseas Development Inst'tute, London, UK)

14:15-15:00 Country Paper, Philippines, by Ms. María Concepción J. Cruz, Assistant Professor and Chairperson, Graduate Program on Environmental Studies (University of the Philippines at Los Baños, Laguna)

15:15-16:00 Country Paper, Pakistan, by Mr. M.A. Chaudhry, Project Economist PRC/USAID (Pakistan Irrigation Systems Management Project)

16:00-16:45 Country Paper, Brazil, by Mr. Eliseu Alves, President of CODEVASF (Development Corporation of the San Francisco Valley)

Wednesday, 24 September 1986

Chairperson Morning Session: Ms. María Concepción Cruz

08:45-09:30 Country Paper, China, by Mr. Xu Guohua, Associate Professor (Department of Irrigation and Drainage, Beijing University of Aricultural Engineering)

09:30-10:00 Country Papers, Jordan and other Middle East countries, by Mr. A. Arar, Senior Regional Officer, Regional Office for near East (FAO) and Mr. J. Keller, Professor (Utah State University)

10:15-10:50 Country Paper, Nigeria, by Mr. J.A. Akinola, Assistant Chief Water Engineer (Federal Department Water Resources, Lagos)

10:50-11:20 Country Paper, Tunisia, by Mr. Habib Essid, Director General of the Irrigation District Gafsa-Jerid, Tozeur

11:20-12:00 Country Paper, Cyprus, by Mr. N. Tsiourtis, Senior Water Engineer, Water Development Department, Nicosia.

Chairperson Afternoon Session: Mr. E. Alves de Andrade

13:30-14:15 Country Paper, Zimbabwe, by Mr. G.D. Mudimu, Department ot Agricultural Economics, University of Zimbabwe

14:15-15:00 Country Paper, Mexico, by Mr. A. Olaiz Pérez, Technical Secretary, Mexican Institute of Water Technology, Cuernavaca

15:15-16:00 Country Paper, Peru, by Mr. C.A. Sarría, Project Analyst, Group of Agricultural Policies Analysis, Ministry of Agriculture, Lima

16:00-16:45 Country Paper, Jamaica, by Mr. T. Hardware, Managing Director of Underground Water Authority, Kingston

Thursday, 25 September 1986

08:45-09:00 Brief meeting of all participants to develop a common understanding of the working sessions

09:00-11:00 Break into five groups to prepare the Main Conclusions and Recommendations (First Task)

Chairperson: Mr. J. Keller

11:00-12:30 Plenary session to compare and discuss the Main Conclusions and Recommendations

14:00-16:00 Groups will wind up discussions on Main Conclusions and discuss their assigned topics (Second Task)

16:00-17:30 Leaders and Rapporteurs convene to synthesize the Main Conclusions and Recommendations as presented by the Groups

Friday, 26 September 1986

09:00-10:30 Groups will continue discussions and prepare a preliminary statement for each set of guidelines for the special topics assigned

Chairperson: Mr. J. Keller

11:00-12:30 Plenary Session to discuss the set of guidelines for the topics assigned

14:00-15:00 Continue Plenary Session

15:00-17:00 Groups separate and prepare their final statement

17:00-17:30 Closing Remarks

ANNEX 2

Expert Consultation on Irrigation Water Charges
22-26 September 1986
FAO, Rome

LIST OF PARTICIPANTS

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ANNEX 3

Expert Consultation on Irrigation Water Charges
22-26 September 1986
FAO, Rome

LIST OF PAPERS

1. Trends of Irrigation Development, by H.M. Horning

2. Approaches to Financing Irrigation, by Ian Carruthers

3. Effect of Water Charges on The Economic and Technical Efficiency of Irrigation Systems, by Allen LeBaron and Jack Keller

4. Operation and Maintenance Costs, by J.A. Sagardoy

5. Cost Recovery in Irrigation Projects: Perceptions from World Bank Operations Evaluation, by Paul Duane

6. The AID approach to Irrigation Recurrent Costs: A Mix of Institutional Alternatives, by Joan S. Atherton

7. Resource Mobilization in Farmer-Managed Irrigation Systems: Needs and Lessons, by E.Walter Coward Jr. and Edward Martin

8. Water Charges: A tool for Improving Irrigation Performance by Leslie. E. Small

9. Why some Farmers do not pay Water Charges, by Eliseu Alves de Andrade

10. Irrigation System Recurrent Cost Recovery: A Pragmatic Approach, by Mark Svendsen

11. Cost Recovery for The Lezíria Grande Project: A Case Study of a Rehabilitation Project in Portugal, by C. de Jong and L.H. Sprey

12. The Dominance of the Internal Rate of Return as a Planning Criterion and the Treatment of O&M Costs in Feasibility Studies, by Mary Tiffen

13. Pakistan - Irrigation Water Charges and Recurrent Cost Recovery, by Muhammad A. Chaudhry

14. Philippines - Financing Irrigation Programmes in the Philippines, by María Concepción J. Cruz and Wilfrido C. Cruz

15. China - Irrigation Water Charges in China, by Xu Guohua

16. Nigeria - Irrigation Water Charge Practices in Nigeria, by J.A. Akinola

17. Tunisia - Irrigation Water Charges in Tunisia: The case of the Oases of South Tunisia, by Habib Essid

18. Zimbabwe - Irrigation Water Charges in Zimbabwe, by G.D. Mudimu

19. Cyprus - Irrigation Water Charges in Cyprus, by Nicos Tsiourtis

20. Mexico - Irrigation Water Charges in Mexico, by A. Olaiz Pérez.

21. Short Report on Cost of Irrigation Water and Irrigation Water Charges in some Arab Countries, by Abdullah Arar

22. Peru - Irrigation Water Charges in Peru, by C. Alberto Sarría

23. Jamaica - Irrigation Water Charges in Jamaica, by Thorant W. Hardware

ANNEX 4

WORKING GROUPS

The Working Groups were organized in order to prepare the policy and technical guidelines with regard to the topics indicated below:

GROUP 1 Financing Irrigation - (Macro Considerations)
Group Leader: G.D. Mudimu
Rapporteur: I. Carruthers
Group members: J. Olivares, J. Atherton, J.A. Akinola, W.S. Post

GROUP 2 Cost Reduction Measures
Group Leader: T. Hardware
Rapporteur: Jack Keller
Group members: P. Duane, E. Telahoun, D. Kraatz, Xu Guohua

GROUP 3 Revenue Enhancement
Group Leader: C.A. Sarría
Rapporteur: W. Coward
Group members: L.H. Sprey, N. Tsiourtis, H.M. Horning, S. Burchi

GROUP 4 Setting Irrigation Water Charges (levels & structure)
Group Leader: A. Olaiz Pérez
Rapporteur: L. Small
Group Members: María C. Cruz, C. de Jong, M. Saiz

GROUP 5 Organizational Structures & Administrative Development
Group Leader: M.A. Chaudhry
Rapporteur: N.S. Peabody III
Group Members: M. Svendsen, M. Tiffen, A. Arar, Habib Essid

The specific tasks assigned to each group were as follows:

First Task Each group is to formulate 4-6 specific statements of the group's Main Conclusions and Recommendations regarding the appropriate forms of irrigation water charge policies (both of national governments and of international donor agencies) with respect to the goals of (a) social equity, (b) economic efficiency, and (c) satisfactory system management.

Second Task Each group is assigned a set of specific issues (below) to be discussed with a view to formulating a set of guidelines and recommendations on matters related to irrigation water charge policies. (These would be "technical" guidelines in the sense that they deal with various details involving economic, social and institutional aspects as well as engineering and agronomic aspects).

WORKING GROUP NO. 1

Question A What are the implications for host countries of the contrast between USAID/World Bank (and other donor) approaches to irrigation cost recovery?
Is financing rehabilitation works different from total scheme development?

Question B Given that a large irrigation project cannot pass conventional economic viability tests, and that the scheme goes forward on various "non-productive" arguments involving equity, etc., how do long-run benefits materialize (when, where and in what form) and how are they measured?

Question C Are there technical criteria that establish the amount of subsidy which a given economy can afford to put into irrigation? How is this answer connected to national and world-wide rates of inflation?

Question D Why can poor farmers in one part of the world pay all costs of irrigation development (less interest/concessionary/interest on original investment) plus continuing recurring costs, whereas poor farmers in another part of the world cannot pay, even though comparison of groups is made by reference to basic food crops? What are the explanations? Are these explanations informed guesses or rationalizations?

Question E
i. How will farmers respond to "indexing"?
ii. Should O&M costs always be recovered?
iii. Can revenues from other sources be increased?

Question F Transfer investment and O&M responsibilities entirely to farmers? The public utility argument.

WORKING GROUP No. 2

Question A What broad measures can be effective in increasing O&M revenues without raising fees and those which increase collection rates reduce the costs of collection, index fee rates, etc.?

Question B Under what conditions can these measures be effectively implemented?

Question C Should irrigation agencies be encouraged to develop secondary sources of income to supplement irrigation fee collections? What types of secondary income sources are most appropriate?

WORKING GROUP No. 3

Question A What broad measures can be effective in reducing the costs of operating and maintaining irrigation systems?

Question B What are the likely impacts of these measures on system performance and sustainability?

Question C Under what conditions can these measures be effectively implemented?

Question D What are the rational arguments for favouring low recurring costs at the expense of high investment cost? (machinery vs. labour, etc.)

Question E Why any maintainance?

Special Questions

i. To what extent might delivering farmers, or groups of farmers, their share of supply, more or less on demand, increase their profits? and willingness to pay charges?

ii. What are the technical options for such flexibility (implied in i. above) in deliveries within direct diversions, storage and mixed systems?

WORKING GROUP No. 4

Question A What broad principles should govern the setting of irrigation fees?

Question B What are the merits of flat rate fee systems vis-à-vis more complex fee structures, i.e. differentiation by system, region, crop, season, etc.?

WORKING GROUP No. 5

Question A What changes in the role and organizational structure of irrigation authorities (and other agencies such as revenue departments) are necessary to establish and maintain an accountable relationship between farmers and the agency?

Question B What is the role (need for) water measurement in water pricing and cost recovery questions?

Question C What roles for farmers beyond the tertiary canal (transferring O&M responsibilities to farmers)?

i. Do governments still alter or transfer indiscriminately farmer managed irrigation systems into state managed irrigation systems? Yes. No. Why? (What is the rationale?)

ii. Delineation of O&M responsibilities farmers can take on, by water source and system

iii. "Social" and "technical" criteria that will govern the transfer possibilities in the situations implied in the answer to question B

Question D Assuming that the best way to improve water use (physical as well as economic) productivity is to make water scarce, what are the operational, economic and "cost recovery" implications of doing so?

ANNEX 5

GUIDELINES FOR THE PREPARATION OF COUNTRY PAPERS

Authors should provide information on most of the items indicated below, but this should not preclude other relevant information being added or, eventually, items which are not applicable deleted.

1. Background information as needed (indicating relevance of irrigation development, predominant crops, types of irrigation, future plans for new irrigation and rehabilitation, public/private irrigation).

2. Present policies with regard to financing of irrigation investments in public irrigation schemes and mechanisms for their recovery.

   a) Define the policies for the financing of irrigation investments in public irrigation schemes.
   b) Percentage of direct subsidies applied to the different kinds of irrigation works.
   c) Government financial contributions in the development of tertiary canals and on-farm works.
   d) Indirect methods of financing irrigation investments (local taxes).
   e) Present policies applied in the recovery of investments.
   f) Effectiveness of the method applied to recover the investment.

3. Payments for the abstraction of surface and groundwater (permission, licenses, charges for river regulation, etc.) where applicable.

   a) Modalities of the charge, duration.
   b) Institutions legally authorized to impose the assessment.

4. Present policies with regard to the financing of irrigation investment in private schemes or farms.

   a) Importance of private and semi-public irrigation (irrigation associations).
   b) Present financial policies applied to incentivate irrigation investments (terms and conditions) by private individuals or groups.
   c) Comparison with public schemes (investment, operation and maintenance, productivity).

5. Present policies with regard to O&M expenditures in public irrigation schemes.

   a) Basis for the calculation of O&M expenditures. Predominant method of collecting of charges. Government contribution (if any). Are the O&M costs arising from the dams included?

   b) Comparison of actual O&M expenditures with those really needed. Illustrate with examples.

   c) Are O&M charges collected separately from investment cost recovery? If the charges are collected by the National Administration, how are they reallocated to irrigation schemes?

   d) Main components of O&M expenditures (staff, repairs, perdiem, administrative staff, energy, etc).

   e) The effect of energy costs in the O&M of overhead irrigation systems.

   f) Decentralization (support staff at central level, provincial and project level).

   g) Compare the O&M cost for irrigation schemes with high investment per hectare with those of low cost. Provide examples. Compare also O&M cost of gravity schemes with those needing pumping.

h) Farmers' participation in O&M decisions.

6. Farmers' Ability to Pay Water Charges.

a) Revenues from irrigated crops
b) Pricing policies for agricultural inputs and farm products
c) Tax policies (on land, produce, income)
d) Evaluation of the effect of water charges in the revenue from crops and on production costs.

7. Problems with the collection of water charges (updating of charges, allocation of government funds to each irrigation scheme, morosity, adequacy of the institutional set-up for enforcing water charges legislation, etc.)

8. Conclusions and Recommendations

9. Bilbiography/References

TABLES

a) Provide at least one table with actual water charges as applied in different regions of the country. Where possible provide some historical data (five years ago and ten years ago).

b) Provide information on the revenues per hectare of the main crops (under irrigation) and their main production costs (including water).

NOTE 1. The length of the paper should not exceed 15 pages typed at single space.
2. Papers should have an abstract not exceeding one typed page.