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COMMENTS ON THE REHABILITATION AMENDMENT

Irrigation Systems Management Project

Rehabilitation II

Report of Reviews made for USAID/Pakistan

by

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PREFACE

This study was conducted as part of the Water Management Synthesis II Project, a program funded and assisted by the United States Agency for International Development through the Consortium for International Development. Utah State University, Colorado State University and Cornell University serve as co-lead universities for the Project.

The key objective is to provide services in irrigated regions of the world for improving water management practices in the design and operation of existing and future irrigation projects and give guidance for USAID for selecting and implementing development options and investment strategies.

For more information about the Project and any of its services, contact the Water Management Synthesis II Project.

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FOREWORD

This report contains the results of analyses made by the Writer during April 20 - May 17, 1987 of certain features of a draft second Amendment of AID/Pakistan's Irrigation Systems Management Project. This amendment provides for a second phase program of irrigation systems rehabilitation, ISR-II. The review was carried out at the request of the Mission through a buy-in under AID's centrally-sponsored Water Management Systems II (WMS-II) Project through Utah State University. Reviews of the Amendment's consistency with the Mission's Post-87 strategy for irrigation (March 1986), concepts of equity and reliability of irrigation water delivery and their evaluation, socio-economic monitoring of rehabilitated subsystems and of the likely effect of the Amendment on social soundness, as set forth in the Scope of Work (Attachment A) are included. The views expressed are solely those of the Writer. They are not necessarily those of WMS-II or the Utah State University.

COMMENTS ON THE REHABILITATION AMENDMENT

| | <u>Page</u> |
|---|-------------|
| I. CONCEPTUAL CONSISTENCY | 1 |
| A. Summary of Post '87 Strategy Statement and Concept Paper ... | 1 |
| B. Amendment Response | 2 |
| C. Unresolved Issues | 3 |
| II. RATIONALE FOR EQUITY AND RELIABILITY | 5 |
| A. Equity | 5 |
| 1. Definition | 5 |
| 2. Discussion of Rationale | 5 |
| B. Reliability | 6 |
| 1. Definition | 6 |
| 2. Discussion | 6 |
| III. MONITORING AND EVALUATION | 7 |
| A. Monitoring for Equity | 7 |
| 1. Measuring Discharge at Outlets | 7 |
| 2. Sampling Technique | 8 |
| B. Monitoring for Reliability | 9 |
| 1. Hydrological | 9 |
| 2. Farmers' Perceptions | 10 |
| C. Evaluation | 10 |
| 1. Equity | 10 |
| 2. Reliability Effects | 10 |
| 3. Discussion | 11 |
| IV. REVIEW OF SOCIAL SOUNDNESS ANALYSIS | 11 |
| A. Review | 11 |
| 1. Benefits | 11 |
| 2. Distribution of Benefits | 11 |
| 3. Impact on Women | 12 |
| 4. Impact of Project Covenants | 12 |
| a. Water Charges | 12 |
| b. Tubewell Divestures | 12 |
| 5. Rehabilitation Design | 12 |
| B. Suggested Amendment | 13 |
| ATTACHMENT | 15 |
| Scope of Work | 15 |

I. CONCEPTUAL CONSISTENCY

A. Summary of the Post '87 Strategy Statement and Concept Paper

The principal strategy concepts suggested in the March 1986 paper entitled "Post '87 Strategy for Irrigation" are summarized below.

At policy level, shifting to a flat rate basis for water charges was emphasized. Internalizing water charge collections and O&M budgets was suggested and removal of subsidies was supported. The paper also supported the principle that users should pay water charges equal to the full cost of O&M, but that other hidden taxes or transfers due to pricing policies, and subsidies should be taken into account. Great concern was expressed over the inability of the PIDs to utilize trainees, develop specialization, or maintain adequate tenure for many job assignments under present personnel policies, particularly job rotation. Even though unrealistic in the near future, abandonment of the rotation system was suggested. In any event, creation of personnel tracks in specialities and longer-term tenures were suggested.

As far as rehabilitation is concerned, the need to more strongly emphasize support for improved design capability and sustained O&M was recognized. This led to the recommendation that current broad support efforts generally should be focussed sharply on supporting rehabilitation design and even more so, on O&M of rehabilitated facilities. While across the board, this suggestion impacted most heavily on training. In contrast to the broad approach then being taken, concentrating on curricula and courses designed specifically to provide the skills needed for design and O&M was strongly advocated. Comprehensive system design and full completion by systems was endorsed.

There was some perception that insufficient attention was being given to operations (scheduling, etc.) and consideration of an operations improvement package was suggested. Other suggestions included use of performance based reimbursement criteria and increased use of local sources of technical assistance and contractual services. There was some evidence that PIDs were having difficulty in maintaining equipment in operating condition, possibly because of shortage of funds in their revolving accounts. This could have been aggravated because of World Bank policy, also followed by A.I.D., which does not permit charging work items for equipment depreciation. The issue was raised, but exactly how equipment maintenance is financed was not well understood.

The Concept Paper added specificity to various points included in the strategy statement. Special attention was given to institutional improvements necessary for planning and managing rehabilitation and supporting functions and of O&M. The paper closely linked physical works with O&M, with the latter being the primary objective, and identified management of systems after rehabilitation as the key element in ISR-II.

B. Amendment Response

A shift to flat rate water charges is recommended under the Amendment. The advisors make a strong case in support of this recommendation in their provincial reports on water charges; but the matter is not covenanted, and probably shouldn't be at this point. It is an important and timely subject for policy dialogue, however.

The Amendment, through the report of its advisors, recommends internalization of water charge revenues with O&M budgets. This would be a radical change. There are good arguments for it which will need high-level discussion.

The principal subsidy will be eliminated with privatization of public tube wells. This issue is covered by covenant in the original project paper and is unchanged by the Amendment. The Amendment recommends gradually increasing water charges. The advisors' analysis targets eventual recovery of full O&M costs. The Amendment adds a covenant requiring PIDs to provide the most conducive setting for cost recovery from farmers.

The Amendment has been less successful in dealing with the problems of personnel relating to specialization and tenure. In fact, recruiting for central office staff has emerged as a serious difficulty. These jobs are not popular among PID employees. However, recommendations have been developed by advisors for addressing personnel issues related to design. These will be explored with Provincial Governments and PIDs to develop a strategy for overcoming institutional constraints. Focusing on on-job direct skill training for O&M, especially at SDO and Sub-Engineer levels will ease the problem in the field. All incumbents in these levels will be trained; be "specialists" in effect, and this should have some effect on future leadership.

As proposed by the Concept Paper, assurance of sustained proper O&M of rehabilitated subsystems is viewed as the main thrust of the Amendment. Effectiveness of subsystem performance is to be measured in terms of reliability and equity, which are carefully defined. The Amendment is particularly effective in sharpening the focus of supporting activities toward this objective, and, in lesser degree toward supporting PID capacity for rehabilitation design. While true for all supporting activities, this is particularly evident in the training program. General training has been reduced in favor of specific skill training for design and O&M. The series of special skill courses for SDOs and Sub-Engineers mentioned above is illustrative and will comprise a major share of the effort. Completion of these courses will be required at subsystem level prior to earmarking of funds for the scheme. A special 16-month training program for canal design will be implemented.

Monitoring standards for reliability and equity are being developed and these parameters will be monitored quarterly. Besides

continuous monitoring of O&M based on a series of manuals prepared under the project, a program of independent monitoring by a separate entity will be implemented. If at any time, O&M on rehabilitated subprojects is found to be deficient, funding of further rehabilitation civil works will be suspended until the situation is corrected.

Interest of PIDs in rehabilitation design has improved. However, institutional difficulties, mostly stemming from personnel policies, may prevent PIDs from developing the needed capacities. In this event, design services will be provided from the private sector by contract.

As the planning for the Amendment has evolved, the linkages to operations have become more evident. The series of O&M manuals, and related training, etc. are what one would expect in an operations improvement package. In fact equity and reliability, which are adopted (along with sustained proper maintenance) are primarily operations efforts. Basic reimbursement continues under the FAR method, however, under the Mission's Agriculture Sector Support Program, additional funds will be transferred to GOP when certain agreed-upon institutional mileposts have been achieved. This means that the essential benefits of performance-based reimbursement should be realized.

The PIDs' problems with maintaining equipment in functioning condition have not impacted on the project so far, but the equipment is still new. The Advisor has recommended that each Province "establish realistic costs for equipment use and adopt a funding procedure which adequately covers ownership and operation." The equipment maintenance situation will be reviewed under the Amended project.

In summary, the project Amendment is quite fully responsive to the proposed strategy.

C. Unresolved Issues

The minutes of the "Retreat" and written comments from Punjab and Sind PIDs received subsequently, reveal several issues raised by the Concept Paper on which there are apparent differences of opinion between the PIDs and AID. Discussion and recommendation is presented below:

1. "Unless O&M of physically rehabilitated systems is proceeding satisfactorily, new construction schemes would not be initiated"

In their written comments both Sind and Punjab flatly opposed this provision; the minutes indicate that the retreat group did also.

AID should not yield on this point. Proper O&M may be even more a matter of discipline and management than of increased

funding. Putting in place the institutional capability needed will not be an easy task. It could drag on indefinitely. Though funding is given as the reason for poor maintenance, proper O&M obviously has not been given a very high priority by the PIDs in the past. AID and other donors can not be expected to continue to support capital investment in irrigation projects unless continued proper O&M is assured.

Some thought was given to the possibility of a short probationary period as a compromise position, but this would be beside the point because approval is schemewise, not continuous.

2. "Periodic inspection by an independent organization to delineate O&M needs"

In their written comments, Sind and Punjab PIDs reject this concept; however the retreat minutes indicate agreement if the organization is in the Irrigation Department, and AID has drafted the Amendment along these lines. AID further proposes that an independent organization under direct arrangement with AID, assist the PIDs in establishing the necessary monitoring capability and insuring that monitoring is carried out on a credible basis. This arrangement seems to be a good practical solution to a rather sensitive issue and would preserve the merits of an independent review. This solution is recommended.

3. "Whatever new Design Criteria is developed would be applied to problematic channels/reaches only"

This position is taken by PID Punjab in their written comments. Adopting it would void the concept of an integrated systems approach which is basic to successful sediment management. Identifying problematic channels is apt to be subjective and redesign of some of the channels would cause other channels not now problematic to become so. Continued application of design criteria to entire subsystems is recommended.

(The statement that "this type of design criteria has never been applied previously in any part of the world" is beside the point, but also believed incorrect. The "regime" approach was developed beginning about 90 years ago in the Punjab and was the basis for the design of the present systems. While embellished somewhat, the basic approach hasn't changed. Regime design has also been used in at least China, Egypt and the U.S.)

4. "To avoid frequent desiltation, it may be more appropriate to line such portions of the channel (tail reaches) to achieve more equitable distribution of canal flow"

Technically, either sediment removal or reconstruction will likely be necessary to achieve reasonable equity for tail enders.

The trade off is annual cost of removing sediment by labor against annualized cost of lining less benefits of increased convenience and reliability. Better information is needed about how effective lining would really be. The idea should not be rejected, but some studies of cost effectiveness and selection criteria would be desirable before deciding to implement it.

5. "No further special check work by USAID officials is desirable and may not be repeated in the Phase II program"

This comment is made by PID Punjab in its written response. The check work referred to is made by USAID engineers to verify construction quality and quantity under the terms of the reimbursement agreement. Not to do this would be irresponsible. There is no valid reason why PIDs should object and experience has demonstrated the need.

II. RATIONALE FOR EQUITY AND RELIABILITY

A. Equity

1. Definition

Under the Amendment, "equity" has a special definition: "Equitable distribution of water (by a channel) means to provide all outlets with their proportionate share as related to their legally sanctioned discharge".

This definition neatly excises all socio-economic considerations of general equity as far as PID performance is concerned. The measurement is against the sanction. How the sanction was decided is not an issue. This leaves delivery of water, its proper business, to the PID, and general equity to policy.

2. Discussion of Rationale

The main rationale for equity under the Amendment stems from concern that tail enders on AID-supported rehabilitated subsystems receive their sanctioned amounts, or when water is short, their fair shares. Commonly, front-enders receive more than their sanctions. The desirable solution would redistribute these deliveries downstream, but reducing established historical deliveries very much is likely to be infeasible. In any case, tail-enders should have first claim on any water-supply benefits resulting from the rehabilitation.

One important reason for emphasizing equity and its monitoring is to document the scope and nature of the tail-end problem with reliable quantitative data as a basis for possible further action. There are some technical possibilities for mitigating tail-end problems such as by installation of wells or lining in tail end reaches, but authorities have to be convinced that the situation deserves attention.

If the proposition that overdrafts by front-enders will continue is correct, then one could argue that legal sanctions should be raised to fit actuality. Doing this could have undesirable repercussions, however. There would be a logical argument for redesigning the outlets to fit the new sanctions. This would simply restore the relative competitive advantage of the front-enders, wiping out any tail-ender gains. For these reasons, the writer is skeptical of the wisdom of raising sanctions to validate overdrafts. If an increased sanction is granted, it should be with the condition that the outlet will not be redesigned.

If nothing much can be done about front-end overdrafts and tail-enders are the main concern, for monitoring, all deliveries equal to or above the sanctioned amount could be taken as the sanctioned amount. This would imply a new definition which would insert "or full sanction whichever is less" following the word "share" in the present definition; but revising the definition, which is correct in principle in the Amendment, is not recommended; rather the matter would simply be handled as a statistical procedure.

B. Reliability

1. Definition

Reliability of irrigation water delivery under the Amendment "is the extent to which irrigation water is received at the canal outlet in accordance with farmers' expectations".

Farmer expectations are the logical reference framework for measuring reliability because they relate to the potential area and mix of crops that are apt to be planted under conditions of full reliability. Because of risk, (measured by less than full reliability), farmers will tend to plant less than that potential. Designating farmers' expectations as the standard against which reliability is measured does not mean that they are static. PIDs should be concerned about raising them through improved performance. This, in effect, is the reason for rehabilitation.

2. Discussion

Conventionally, reliability has been thought of as the extent to which irrigation water is available to meet full crop water requirements at all times during the crop growth period. Too often, the full-supply assumption has been used to design irrigation cropping systems where it does not apply. Most irrigation systems lack full reservoir storage and these nearly always encounter periods of scarcity, at levels that are quite unpredictable during at least part of the growing season. As the Amendment points out, irrigation farming strategy should be to choose cropping systems which will optimize the use of water

sources that very often do not provide a full supply. For the Indus system this is invariably the case.

In areas where arable land exceeds available water supply, irrigation systems, especially in South Asia, are designed to provide irrigation for only part of the command each season. This provides various options for farmers as reliability is increased and expectations rise. There are probably several reasons why such "extensive" designs were adopted. One undoubtedly was the desire to provide some irrigation benefits to a maximum number of people. Another may have been to avoid consecutive seasonal cropping on the same field because of the problem of timely harvest and tillage between crops. A third reason may have been to avoid waterlogging. In recent years, with mechanization, improved drainage, increased surface storage and tubewell supplies; increasing irrigation cropping intensity has become more feasible.

III. MONITORING AND EVALUATION

A. Monitoring for Equity

1. Measuring Discharges at Outlets

Outlet structures (modules) are in-fact flow-measuring devices. Whether or not using them for monitoring equity is practical or desirable needs to be decided. If not, then either portable measuring devices such as Parshall or cutthroat flumes or some other suitable technology could be used temporarily; or permanent devices, such as these flumes or Replogle-type broad-crested weirs could be installed just downstream from the outlets. These options are discussed briefly below.

Outlet Structures: Almost all outlet structures are either Jamrao-type open flumes (OF) or adjustable orifice semi-modules (AOSM)s. According to PRC Engineering/Checchi's design reports a few AOSMs have been fitted with steel orifice plates (OP) replacing the classical bell-mouthed entrances but none were noted in the design schedules. While uncontrolled pipe outlets are still in extensive use in Pakistan they apparently will not be used on rehabilitation projects.

OF and AOSM devices, including discharge formulas, were developed in the 1920s by Punjab irrigation engineers. (Mahboob and Gulhatti, 1944). Though this technology has remained frozen since, the OF and AOSM are the survivors of several dozen designs which were laboratory and field-tested during the early 1900s. They are "semi-modular"; that is, the discharge depends only on the upstream water level, thus they are "critical flow" devices. Equity, both for water and silt deliveries to outlets was a necessary design condition. Low sensitivity to canal water level changes was an objective. The last two parameters are handled by the vertical positioning of the device with regard to the canal bed and full supply water level in the distributary channel

The difficulty with using the modules to measure equity arises from questions about their accuracy. Moreover, some will have been changed unlawfully by farmers. Some limited field studies (in India) show that actual field accuracy of individual outlets is quite variable. This is not surprising because orientation of the outlet alignment to the flow in the distributary and small inaccuracies in outlet dimensions as constructed (especially open flumes) could cause fairly large variations in discharges.

Portable Measuring Devices: These must be installed properly and this requires good technical skill and discipline. A carelessly installed flume could be as inaccurate as a module. This suggests using a specialized, well-trained mobile team for making the measurements. Portable measuring devices also require a drop in water surface elevation (0.25'-0.50' min) which may not be available in the watercourse without drowning the critical flow section of the module. If the watercourse has been lined, use of portable flumes may not be possible. Sharp-crested weirs could be used, but these need more water surface drop. A third possibility might be the use of micro current meters.

Permanent Installations: As an alternative to temporary installations, installing a permanent measuring device such as a Replogle-type broad-crested weir may be about as easy. This could be used later for periodic checking, but it would probably be removed by farmers who often perceive these as obstructing their flows. If this choice is made, farmers' perceptions need to be taken into account; they could easily infer that the exercise is a trick to reduce their shares. The use of temporary flumes would face this same problem but in less degree.

Conclusion: The hydrographic consultant may be able to clarify some of the issues raised above. The use of modules would be simplest, but accuracy implications at both design and partial flow, need to be examined carefully. Whether or not modules are used for the measurement, the system error is the same. Using modules only, its magnitude will be unknown. Thus some independent set of flow measurements, controlled for accuracy for at least sample sets, should be made. A flexible, multiple-device approach at first seems best. This could be adapted as experience is gained. At an appropriate time some attention should be given to statistical design, utilizing the services of someone specializing in that discipline.

2. Sampling Technique

To get a feeling for sample size and choice, design reports for two subsystems, Almani and Hala were reviewed. Almani, with CCA = 70,475 A, shows 106 total outlets. there are four minors, one is treated as a single outlet. The number of outlets on the other three

minors range from four to seven. One distributary has 35 outlets, the other one has 48. The branch has six. Hala is probably more typical. The number of outlets per minor for the eight minors ranges from 4 to 15, averaging about 10. Two distributaries serve 27 and 31 outlets directly, but no minors; a third distributary serves six minors, (the other two are from the branch) and 27 outlets. The branch itself serves 13 outlets. Hala serves a total of 176 outlets and has a CCA of 91,557 A.

All levels, minor, distributary and branch seem to be candidates for the random selection. Equity may be partly a function of channel size. One would expect it to be higher for the larger channels. In any event the sampling will reveal this. Some limitation on the number of outlets measured makes sense. Tentatively, if the number exceeds (20)* a (50)% random sample or a maximum of (15), whichever is less, should be adequate. If the number of outlets is (20) or less, all should be measured. For channels serving both minors and outlets, only the direct outlets would be included in the sample.

Random Selection: Selection of the sample channel and outlets when applicable should be truly random, i.e. drawn from a hat. All channels should be included each time even though some will have been done previously.

B. Monitoring for Reliability

1. Hydrological

The information should represent what is experienced typically within the system. This will not be gained by measurements at the heads of off-taking channels but at some area-wise representative point within a channel reach. Interpretation depends on the level of variation in deliveries to the subsystem itself so one station should be at the subsystem headworks. Tentatively, subject to review by the hydrographic consultant, a station is suggested near the area center of gravity of the CCA for each distributary serving (10,000)A or more. If the area exceeds (30,000)A it may be subdivided into two approximately equal CCAs and a station located for each as above. Deliveries to heads of minors serving from (2000)A to (5000)A or more, could be a good reference also. Normally this would be the last qualifying minor on the distributary.

In some places, use of Parshall or cutthroat flumes or broad-crested weirs may be possible. Generally a short masonry or concrete control section rated by current meter will probably be needed. Sediment deposition could change the rating so soundings should be made of bed elevation upstream to insure that this has not happened. Though station rating should be checked periodically by current meter survey, shifting to a new rating because of sediment deposition would not yield reliable data.

* () indicates suggested value, subject to review.

Rather than drum-type graphical stage recorders the state-of-the-art may have progressed to the point of digital recording using solid state timing and memory (datapod) which might be transcribed directly into a microcomputer program. The hydrographical consultant should be able to comment on this.

2. Farmer's Perceptions

Simple unstructured random interviews of farmers would probably not yield reliable information, so some more formal survey program should be adopted. Only a few simple questions would be needed. Design of the survey and its conduct could be contracted for with a qualified local institution. Developing relevant questions would require collaboration with irrigation technical personnel. Supervision responsibility by the USAID Project Officer seems to make sense, as does procurement directly by USAID.

C. Evaluation

The following discussion relates to the 1990 Evaluation.

1. Equity Effects

Equity information for a set of channels will have been collected for rehabilitated subsystems. Reliability (actually variance, because farmer expectations are not included) is viewed as a subsystem characteristic, but if it happens to vary systematically by location, some estimate of reliability might be made for the channels. At this stage of development, irrigation intensity is likely the best choice for the dependent variable. It is probably the most sensitive and PIDs could readily compile it. Both equity and irrigation intensity are simple, non-dimensional ratios.

The primary effort would be to correlate irrigation intensity with equity; if the reliability data appears dependable, the multiple correlations among the three variables could be attempted. Two years of monitoring would yield equity data on up to 16 channels. This is a good sample size, so the entire set would be included.

2. Reliability Effects

Once the physical rehabilitation is in place, temporal changes in reliability (variance) can be attributed to management. Seasonal reliability could be correlated with irrigation intensity, but with a lag-time of one year. Reliability could be expressed in terms of mean and standard deviation, but number of days missed could be the most important factor. Both correlations could be tried.

3. Discussion

Use of Controls. The proposed approach is internal, that is, there is no external control case. While considered, use of a control by baselining the subproject in advance or a non-rehabilitated subsystem did not seem practical or possibly even valid, because of system changes due to rehabilitation.

Use of Production Data. Production would be a valid substitute for irrigation intensity. Realistically one would need to use a village base. For the equity case, production data for one or more villages representative or located on each channel, would be compiled. The likelihood that such a set of villages would exist is nil, however. For reliability, this approach would work nicely, because the sample set of villages would not need to be associated with specific channels.

Assistance to PIDs. The Amendment provides for assistance to PIDs in their monitoring operation through an organization procured by direct arrangements with AID. This responsibility should include assisting the PIDs in monitoring and compiling the necessary data for the above evaluation.

IV. REVIEW OF SOCIAL SOUNDNESS ANALYSIS

A. Review

The Amendment adds canal-bank roads to the project. The main conceptual change is a strengthened commitment to proper and sustained operation and management of rehabilitated subsystems. At the same time, emphasis on reliability and equity is increased and clarified. The content of the original project paper Social Soundness Analysis was examined with these changes in mind. A draft "Social Soundness Analyses" for the Amendment is given in Section B.

1. Benefits

Under the Amendment, the project will not only continue to provide but will strengthen the four benefit items listed in the text. One benefit not mentioned in the original project paper could be reduced seasonal migration of farm labor. There doesn't seem to be significant unemployment; however so the evidence available at this point doesn't support adding it.

2. Distribution of Benefits

This section covers distribution and effects of size and location of holdings. With modifications for location, distribution of irrigation benefits are proportional to the size of holdings. Unlike irrigation, size of holdings does not affect access, to roads, but location may. Like irrigation, benefits of roads from transport of commodities will follow size of holdings.

The last sentence in the original project paper leaves the whole Chapter making the implication that the sole source of increased on-farm employment is increased availability of water in tail-end water courses. Actually increased employment will follow from increased production any place in the system

3. Impact on Women

Only indirect benefits (which are stated vaguely) are noted for women, although some, in tribal areas, receive direct construction employment. The conceptual changes would facilitate these benefits but would not change the framework. This would also apply to roads, and roads should be added to the list of benefits. PIDs have agreed to employ women professional engineers to participate in rehabilitation design.

4. Impact of Project Covenants

a. Water Charges

The conceptual change by the Amendment can only improve the ability and willingness of farmers to pay higher water charges. Adding roads cannot but help the general rural economy also. This has been widely demonstrated elsewhere.

One covenant is added by the Amendment. It requires provision of the "most conducive setting for recovery of O&M and capital costs." The characteristics of this setting are reliable and equitable deliveries and full maintenance of rehabilitated facilities. The strengthened commitment to provide equity, reliability and sustained maintenance can only enhance the social soundness of the project.

b. Tube well Divesture

The Amendment will not affect the divesture process, but it may change the incentives. More reliable and equitable irrigation deliveries could reduce the interest in groundwater; conversely, because of increased earnings, farmers might in the long term be in better position to expend their operation or improve their choice of crops.

In the second paragraph the original project paper statement implies that farmers receive public tube well water free. This is not correct. Actually the charge is twice that for canal water in both Punjab and Sind (PRC/Checchi, 1986, 1986a).

5. Rehabilitation Design

This subsection is concerned about the equitable distribution of silt to outlets and about increased labor and other

impacts on watercourses which are now receiving less than their equitable share. The Amendment emphasis on equitable delivery of water will also facilitate equitable delivery of silt.

A technical question is whether or not the module, whose crest is set at $0.1D$ or $0.2D$, where D is the full-supply depth of water in the canal, would indeed tap the sediment load, which is transported in the turbulent boundary layer immediately above the bed. Further checking shows that the module designs being used have been shown to perform this function satisfactorily.

B. Suggested Amendment

The Social Soundness Analysis in the original project paper remains applicable to this Amendment. Social soundness is enhanced by constructing roads along canals and drains, a new activity under this amendment and by a strengthened approach to sustained proper O&M as measured by increased reliability and equity. Addition of roads will help rectify a major deficiency in the agricultural production system. Farmers will readily accept these; they are already using them illegally. Because they will be equally available to all, they will improve the overall socio-economic equity of tail-enders. The technical design and construction capability to install and maintain these roads is available; though institutional responsibility needs to be further defined, this is feasible. Though, in the short-term, improved reliability and equity may reduce interest in groundwater development, in the long-term farmers will be better positioned financially to expand their operations through groundwater development. The addition of roads and the increased emphasis on proper O&M, reliability and equity are judged as improving the social soundness and feasibility of this project.

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ATTACHMENT

SCOPE OF WORK

I. Consistency With Concept

The second ISM Project Paper (PP) Amendment is intended to be consistent with the USAID Post '87 Strategy Statement of March, 1986 for the water sub-sector. Suggestions of this paper were refined and made specific in a USAID Concept Paper dated November 1986. At that time, USAID informed Government of Pakistan (GOP) of its intention to proceed with the PP amendment for future Irrigation Systems Rehabilitation according to these concepts.

On March 17-18, 1987, at a Retreat, high ranking officials of GOP, the PIDs, World Bank and USAID related with Irrigation Systems rehabilitation and institutional development components, exchanged views regarding the concept paper and other related problems and issues. Written comments on the concept paper have also been received by USAID from Punjab and Sind provinces.

The Consultant will review the draft PP Amendment for consistency with the Strategy Statement and the Concept Paper, taking into account the views of the GOP and PIDs as expressed in the records of the Retreat and, formally, in the written comments of the Sind and Punjab PIDs. Where these differ from AID's position, the Consultant will make appropriate recommendations to AID.

II. Social Soundness

The social soundness analysis in the original Project Paper may be adequate. The Consultant will review this section and develop a rationale for its adequacy in view of the fact that social soundness of the project will improve due to added emphasis on equity and reliability of supply at mogha.

III. Rationale for Reliability and Equity

The Consultant will examine the economic and social rationale for "reliability" and "equity". Here equity applies to deliveries to outlets, which is the responsibility of the PIDs, not to individual farms. While some limited literary review will be attempted, the model will necessarily be semi-empirical.

IV. Monitoring and Evaluation

The Consultant will review the outline developed for monitoring of hydraulic performance including equity and reliability variables as contained in the PP amendment. He will also develop an approach and guidelines for implementation of the monitoring and evaluation systems which will include monitoring and evaluation of hydraulic performance, and social and economic effect of the Project amendment activities at sub-systems level.

V. Editorial Suggestions/General Comments

The Consultant will review the draft amendment generally and make any comments and editorial suggestions, which he feels may be useful.