

Mission Response
to the RIG/A Report:
Audit of Information Used to Monitor Progress
on
USAID/Egypt's Irrigation Management Systems Project
(No. 263-0132)

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SUMMARY

The Irrigation Management Systems project (IMS) is very large (\$336 million) and very complex (10 different components). It began in 1982 and will end after fourteen years of implementation in 1996. The IMS project has had a comprehensive evaluation and monitoring system since its inception. Based on a major external evaluation in 1990 and the monitoring and evaluation findings available, USAID/Egypt believes that the project has generally been highly successful in improving the performance of the irrigation system. This has contributed (along with other factors such as an improved policy environment, availability of improved technologies, etc.) to increased agricultural production. Based on the success of IMS (and on strong pressure to reduce US staffing), USAID/Egypt does not intend to fund a follow-on irrigation project as such. Selected irrigation activities will continue to receive support under other related projects.

USAID/Egypt is concerned that this performance audit does not provide a balanced and accurate assessment of the returns to a very large investment of resources, or of the successful efforts of large numbers of American irrigation experts over many years. It contributes very little to improved decision-making for this or similar projects. These deficiencies stem from the lack of adequate expertise on the audit team. The audit team lacked the irrigation expertise necessary for an overall assessment of program design and impact, and lacked the methodological expertise necessary for an assessment of the system for tracking program results in terms of higher-level objectives. USAID/Egypt and the Asia/Near East Bureau offered to help obtain such expertise, but the auditors deemed it unnecessary.

With the IMS audit the Office of the Inspector General (IG) has abrogated unilaterally a 1994 policy (State 070069) on performance audits. The policy was to narrow the scope of performance audits sufficiently to avoid the issue of substantive or methodological expertise. The broader approach taken by the IMS audit is legitimate but carries with it the obligation to assure that adequate expertise is available to the audit team as envisaged by GAO guidance. The IMS performance audit has not fulfilled this obligation and has not contributed to any improvement in USAID irrigation programs or in monitoring and evaluation systems.

Both audit report recommendations are directed at assessment of investment in a potential follow-on irrigation project. Since USAID/Egypt is not planning such an investment, both recommendations should be closed upon issuance of the audit report.

MISSION'S RESPONSE TO AUDIT RECOMMENDATIONS

BACKGROUND

Egypt, as Herodotus said, is "the gift of the Nile." Without the Nile, Egypt would be simply a huge desert punctuated by a few oases. Agriculture based on irrigation drawn from the Nile made possible the emergence of ancient Egyptian civilization over 5000 years ago. Today irrigation-based agriculture accounts for nearly 20 percent of GNP, or 40 percent if defined more broadly to include agriculture-related industries (e.g. fertilizer, food processing, textiles). As a consequence, US assistance to Egypt has always devoted considerable attention to agricultural development, including irrigation. Under the Point Four program in the 1950's, the U.S. assisted in the design of the Aswan High Dam, later constructed with Soviet aid. When USAID initiated its current program in 1975, irrigation projects were among the first to begin under a program called Egypt Water Use and Management.

The subject of this performance audit, the Irrigation Management Systems project (IMS), was the culmination of nearly thirty years of U.S. involvement with Egyptian irrigation when work on the first three components was authorized in FY82 at \$42 million. Based on intensive studies and analyses carried out under this project and its predecessors, an additional seven components were eventually authorized through two project paper amendments at a total funding level of \$336 million. The evolution of IMS in terms of its components and the funding levels involved is shown in Annex I. The project is now scheduled to terminate at the end of FY96.

The IMS project was designed to meet most of the conditions for sustainable water resources development. USAID attempted to fund and deliver all of the necessary conditions for achieving an increase in the efficiency of the massive Nile irrigation system and simultaneously develop the institutional capacity of Egypt's Irrigation Ministry to continue to improve long-term system efficiency. While some components have been more successful than others, USAID/Egypt believes that the project has generally contributed very significantly to the performance of irrigation in Egypt, and thus to increased agricultural production. This belief is based on monitoring and evaluation efforts which have continued from the beginning of the project in 1982 and covered all components.

USAID established numerous quantifiable indicators to measure IMS success and complemented this monitoring with several external evaluations and assessments. The major external evaluation took place in 1990. In order to do justice to the size and complexity of the project, an evaluation team was comprised of 13 experts with backgrounds in agriculture, irrigation, engineering, and the social sciences. The evaluation was generally positive, and

spoke of "all components" contributing to the IMS purpose. On the basis of the evaluation's recommendations, USAID made several adjustments in the project, including funding levels, personnel selection and qualifications, component inputs and outputs, and life of individual components. Subsequently, different components have been assessed and evaluated more than once, like the Irrigation Improvement component (IIP) and the Preventive Maintenance component (PM).

Given the success of IMS, USAID/Egypt has decided not to proceed with a follow-on stand-alone irrigation project. However, because irrigation is too important to ignore and the U.S. still has much to contribute, future activities related to irrigation will be funded and managed in association with other USAID-supported activities addressing agricultural technology transfer, agricultural policy and water quality. This will permit the Mission to phase out its irrigation office and reduce its US Direct Hire (USDH) staffing for irrigation from 4 in FY95 to 1 by FY97, helping meet the mandated reduction in operating expense (OE) resources.

The IMS performance audit comes as USAID approaches the end of its large-scale and very effective involvement in improving irrigation system performance in Egypt. USAID/Egypt is concerned that the audit report does not provide a balanced and accurate assessment of the returns to a very large investment of resources and the successful efforts of large numbers of American irrigation experts over many years. It also contributes little to improved decision-making for this or similar projects.

USAID/Egypt is a strong supporter of both financial and performance audits, and takes pride in the success of its efforts over the years to improve accountability and to improve (and demonstrate) project effectiveness and impact. An independent audit function is essential. However, program or performance audits can only contribute to improved project design and effectiveness when they are based upon professional expertise adequate to the task at hand. That was presumably the rationale for the policy decision in 1994 (State 070069) to focus performance audits on the adequacy of project monitoring and evaluation systems and on achievement of lower-level objectives ("outputs"). With the IMS audit, the Office of the Inspector General (IG) has decided to unilaterally abrogate the 1994 policy and to attempt to assess overall project impact and the achievement of higher-level indicators ("purpose").

This broader approach requires a level of professional expertise which is not normally available among audit staff (nor should it be). USAID/Egypt's view is that this broader approach is legitimate but carries with it the obligation to assure that adequate expertise is available with respect to the substance of the program involved (irrigation in this case) and evaluation

methodology (which becomes more complex as we proceed from lower-level to higher-level indicators and impacts). This is particularly true since audits are generally the only reports on project performance of interest to Congress, the public and the media. The "general deficiencies" discussed below are a measure of the degree to which this audit has not fulfilled this obligation and has thus not contributed to the performance audit objectives set forth by GAO guidance.

USAID/Egypt's reasoning is set forth in the three following sections which discuss general deficiencies of the audit Report, the Mission response to Audit Recommendation 1 and the Mission response to Audit Recommendation 2.

GENERAL DEFICIENCIES OF THE AUDIT REPORT

The general deficiencies in the report stem from the fact that the audit was conducted by a team which did not possess adequate technical expertise. Contrary to GAO Audit Standards (GAO Government Audit Standards 1994 Revision, 3.3 and 3.10), the team did not possess "adequate professional proficiency" or "skills appropriate" to make the highly technical judgements which it rendered. As noted above, the IMS project is such a technically complex and comprehensive project that when it was fully evaluated in 1990, the evaluation team involved 13 members from different agricultural, irrigation, social science and engineering disciplines. USAID/Egypt urged the audit team to acquire adequate technical expertise, as provided for by the GAO Handbook. USAID also offered to provide staff from USAID/Washington with expertise in irrigation and in evaluation methodology to work with the audit team. Unfortunately, the auditors decided that additional technical expertise was not required. The result was a report which is deficient both in its assessment of the project and in its recommendations regarding evaluation methodology.

The report's general deficiencies include the following:

- the report ignores the impact of major IMS components which account for 37% of project expenditures;
- it fails to distinguish between immediate and long-term contributions by different components;
- it does not differentiate the impact of "key" outputs from all others;
- it conveys its findings in a very negative tone, with examples of biased, inadequate and incorrect reporting; and
- it unilaterally ignores previous distinctions between evaluations and performance audits negotiated between USAID/Washington and the IG

Impact of Major IMS Components The report fails to factor in the impact of major components and characterizes IMS as a number of

components with equal potential to contribute to the project purpose. For instance, it virtually ignores two components, representing 37 percent of total project expenditures: Structure Replacement and Preventive Maintenance. The former replaced almost half (19,000) of the irrigation structures in the country, and the latter was implemented in governorates comprising about half of Egypt's irrigated area. Irrigation experts would recognize the following linkages between improved irrigation efficiency and key IMS elements:

1. To increase efficiency, it is essential to improve equity and reliability of water distribution at all levels, and to avoid spilling water to "sinks" from which it cannot be retrieved. The increased operational control provided by replacement of over 19,000 badly deteriorated structures under the Structure Replacement (SR) component would absolutely be recognized as a major reason for measured increases in irrigation efficiency. SR work was completed in 1992. One study shows that the structural component was implemented so successfully that it may have increased system efficiency by 5 percent while the overall target for all components was 3 percent (See Annex III).

2. There was a similar contribution from the Preventive Maintenance (PM) component. This component was implemented in governorates comprising about half of Egypt's irrigated area, and most component elements were in place by early 1993. To date, Ministry managers have focused PM resources on priority rehabilitation and major maintenance activities that have achieved the same results as noted above for SR. (PM was not addressed in the draft audit report, apparently because its potential impact on efficiency was not recognized!); and

3. With infrastructure needed for controlling the distribution of water in place as a result of SR and PM components, the MSM telemetry system has been providing the information needed for management.

Immediate vs. Long-term Impacts The report reflects limited understanding of the interrelationships and differing impacts of the individual components on irrigation efficiencies. Some components like Structure Replacement have immediate impact on the system. Others involving training, irrigation research, planning studies and models, and main systems management have long-term impacts which are realized only gradually, e.g. as human resources are developed.

The report questions whether IMS initiatives could have resulted in improved efficiency because "major project components have yet to be completed" (p. 8). The analysis reflects a limited understanding of the kinds of impact that each IMS component should have on irrigation efficiency. It was erroneously assumed that all IMS outputs have equal potential for improving

irrigation efficiency in the short term. Page 5 of the draft report states that: "...for the three largest remaining components...key output targets have only been about half achieved." Implying that uncompleted outputs were "key" to achievement of increased efficiency, page 8 erroneously concludes that "the mission cannot assume that these--and other components which are not yet complete--have been contributing to increases in efficient irrigation over the last several years."

The report's perspective does not take into account the following points:

1. Irrigation Improvement Program (IIP): While this component accounts for a substantial portion of the project budget, it is a pilot effort covering a relatively small area. Its impact on efficiency must be viewed in a long-term perspective; no substantial system-wide impact to date is claimed by USAID, and auditors should not have considered it as a means to increase efficiency in the short term. The IIP pilot is so successful, however, that the World Bank is lending Egypt \$250 million to replicate this program on 250,000 *feddans*¹.

2. Planning Studies and Models (PSM): Although most benefits from this component are indeed to be achieved in the future, comments on page 9 do not reflect an understanding of the significance of the Monitoring, Forecasting, and Simulation (MFS) element (the largest) of PSM. This activity is not discussed in the draft, yet MFS forecasts of Nile flows are being used to plan irrigation operations on a macro scale, thus contributing to increased efficiency.

Impact of Key Outputs vs. All Outputs The report fails to distinguish between key outputs of a component and all outputs. In all projects certain outputs are essential and basic to project success while other outputs complete the project. For instance, the report argues that the Main Systems Management (MSM) component of IMS is characterized as having achieved only about half its targets. However, the report fails to point out that the essential telemetry sites (those on main canals and key branches), installed and operating by MSM, have been in operation for some time and provide continuous irrigation data to decision makers who manage all of the water distribution throughout the entire national system. The other sites which are being completed provide more comprehensive data and are being completed in the project's last stages. On page 9, the draft audit states that it is unlikely that efficiency has improved as a result of these sites because their use has been limited to "monitoring of water levels." The auditors understood neither that (a) the

¹One *feddan* is equivalent to 0.42 hectares, 1.037 acres.

function of the telemetry sites is indeed to monitor water levels; nor (b) that even if these levels are not converted to discharge (rate of flow), their constant availability is invaluable to managers because of the unique characteristics of Egypt's canal system.

Negative Tone

1) Biased Reporting: We question the negative tone and lack of balanced reporting. Example: The Mission never made claims that the audit insinuates that it did. In the executive summary (p.6), the report recommends that USAID/Egypt "Revise over-optimistic conclusions on results achieved by the project." This is based on a gross misinterpretation of the portfolio review documents. Example: Four valid points by Mission personnel are lumped together in one paragraph (p. 10, second full paragraph) in a way which discounts their validity and force of argument. Example: The paper fails to point out that the Mission has been dealing with this complex issue of measurement for some time. It was the motivation behind the Project Paper amendment and much of the portfolio review process.

2) Inadequate Reporting: Treatment of certain significant issues is lacking in rigor. Example: It fails to deal with the fact that this "project" is more akin to a "program;" which means that the nature of its indicator is less direct, but nevertheless still a valid indicator. Example: It does not deal well with the historical nature of the project and the difficulty of retro-fitting one indicator on a project which historically has been an institutional strengthening project. Had the Mission opted for RIG/A's suggestion that survey and mapping work could have been done more cost effectively by purchasing the work from US supplier of these services and products the Mission would not have been consistent with the previous IMS Purpose, which was institutional strengthening. Example: It claims that certain components do not "deal directly" with **water-use efficiency**. This fails to take into account their crucial, indirect relationships to the project. (The report attacks the Professional Development, Water Research Center, and Survey and Mapping components on these grounds (see p. 9.) Criticizing program components because they do not "deal directly" with the program objective indicates a total lack of comprehension of development assistance, which by design takes on activities whose impact is felt only in the long term as part of the interacting series of improvements.

3) Incorrect Reporting: It seems that the audit report has overlooked facts and has based general conclusions on small samples. Example: It argues that the proxy indicator is not the proper indicator to be using even though the proxy **underestimates the water-use efficiency**. The report also doesn't acknowledge the close relationship between proxy and estimates that the auditors were shown from statistical models which attempted to

measure consumption of agriculture more accurately. The audit team was shown modeling analysis that began well before 1992. Example: The draft contends that the Mission became concerned about performance measurement in 1993 when in fact our efforts were initiated prior to that. Proof exists in 1992 not only from the performance review documents but also from the Webb report on the impact of Structure Replacement (Annex III).

Unilaterally Ignores Distinctions between Evaluation and Audits

The audit report ignores the distinction between evaluations and audits which had been reached in 1994 between USAID and IG (see State 070069). The previous guidance on the relationships of performance audits to evaluations defined the general focus of audits to be at the output level and the analysis of the agency's monitoring systems, rather than delving into areas which required extensive, specialized expertise. The report and its weaknesses stem from the fact that the IG unilaterally decided to ignore the agreed-upon distinction. The IG decision to abandon a strategy which prevented wasteful overlap between performance audit and evaluation has serious implications for USAID's efforts to manage for results.

THE MISSION RESPONSE TO RECOMMENDATION NO. 1:

Recommendation No. 1: We recommend that USAID/Egypt revise the current project purpose-level indicator, so that it is plausible and objectively verifiable. The redesign must consider how components, which are not completed, contribute to the overall project purpose and must also be used to decide whether further investment in a follow-on project is warranted.

Response:

This recommendation fails to take into consideration the following points:

- the indicator utilized is reliable and cost effective;
- it confuses Agency guidance on project outputs with guidance on purpose and performance level results.

A Reliable and Cost Effective Indicator The original project purpose of IMS was to strengthen the MPWWR's capability and capacity to plan, design, operate, and maintain the water distribution system. The project's goal was to establish effective control of Nile Water for all uses, but particularly for their optimal allocation to and within agriculture as a means of helping increase production and productivity. The original impact level indicator from the 1982 IMS Project Paper was increased productivity and adequate water supplies for farmers. When the IMS project was amended in 1993, the project goal was to increase production and productivity in the agricultural sector. The project purpose became "to improve the system-wide water use efficiency for irrigation," and the indicator was irrigation

efficiency system-wide would increase by 3% over the life of the project. (Irrigation efficiency was defined as total value of agricultural production divided by total volume of irrigation water used.)

The report criticizes the Mission for not calculating the indicator as specified in the project logframe, i.e. that efficiency would be measured by the value of agricultural production divided by the quantity of irrigation water. Instead, the Mission divided value of agricultural production by total water released into the system by the High Aswan Dam. This data is reliable, readily available and it vastly simplified the calculations. Attempts to measure the exact amount of water available for agricultural production found the figure unreliable and costly to obtain. The Mission estimated that it would run in the million dollar range and decided that this was not a cost-effective investment for a project nearing the end of its lengthy implementation.

The fact is that the Nile basin is a closed system with virtually all surface and ground water originating at the High Aswan Dam. Rainfall is negligible. The use of total water released in the denominator of the efficiency fraction gives a more conservative estimate than using an estimate of the amount actually delivered for irrigation. This is because calculating water for irrigation only subtracts out: 1) water consumed by municipal and industrial users; 2) water lost to evaporation; and 3) water flowing to the sea. In Egypt, USAID analysts have attempted to more accurately measure the exact amount of water use in irrigation. It has been explained and demonstrated to the auditors that even if more accurate data existed (and it does not) on the exact amount of water available for agricultural production, it would not significantly change the computed results of the indicator for water use efficiency.

The audit challenges the validity of the IMS Purpose-level indicator. By definition it is only an indicator: water use efficiency defined as and measured by the total value of agricultural production produced in the Nile irrigation system, divided by the volume of water entering the system from the High Aswan Dam, the only significant source of supply. Ample, verifiable data and official documentation was shown to the audit team that proved this indicator is widely used as a measure of irrigation system performance by irrigation experts worldwide. Economic and engineering development experts with whom the Mission consulted all agree that the indicator is quantifiable, independent, plausible, and objectively verifiable. (See Annex II).

The Mission realized at the time the indicator was selected that IMS activities were not the only factors contributing to water use efficiency, as measured by this indicator. The Mission also

knew that IMS investments were of the type that are necessary for and can be expected to lead to improved operational efficiency of any irrigation system. In 1993 the Mission conservatively estimated an increase of 3 percent in the IMS Purpose-level indicator over the life of project. The actual, measured increase in the indicator was approximately 38 percent. The Mission is well aware that some of the increase was due to the combination of impacts attributed to the Mission's policy reform efforts, technology generation and transfer and human resource development. The indisputable increases in area cultivated, cropping intensity, and productivity gains that might be attributed to policy reform, however would not have been possible without the improvements in irrigation management, directly supported by IMS.

This fact is easily documented because the supply of water available for agricultural and other uses has been essentially fixed with minor variations and it is closely monitored and well documented. Over the period 1981 to 1993, competing demands for water from sectors other than irrigation have grown significantly. Thus, the share of the total supply available for irrigation is reduced. At the same time, cropped area increased from 6.1 million *feddans* to 7.2 million *feddans* and the cropping intensity (times a plot of land is cropped annually) increased from 170 percent to 200 percent. Thus annual irrigation area has increased from 10.4 million *feddans* (6.1 million times 1.7) to 14.4 million *feddans* (7.2 million times 2.0). This indicates how significantly overall system efficiency has improved.

Moreover, the GOE policy change in the mid-1980's, allowing farmers to decide what crop they will grow and the area planted, changed the peak demand for water and caused a different management problem for the Ministry of Public Works and Water Resources (MPWWR). IMS information systems, planning tools, infrastructure, training and research enabled the MPWWR to respond to the different and more dynamic set of crop water requirements, to allow an increase in productivity.

The audit correctly reports the lack of precise, quantifiable causality between the outputs of the IMS components and the purpose level. The Mission could have attempted to verify the link in causal terms had it been required to and wished to invest the funds to produce such an analysis. Such an investment for statistically valid testing of the hypothesis that project inputs caused purpose level effects would have cost an estimated \$1.0 million. The Mission considered this option and rejected it as unnecessary and a poor investment of public funds.

Misinterpretation of Agency Guidance on Project Output and Project Impact Indicators The audit misinterprets or fails to take into account the difference between the rather exact guidance on project outputs which calls for precise, verifiable indicators and the more indirect linkages with higher level indicators. "Targets at the output, project purpose, and sector/program level are to have a hypothesized, causative relationship to each other which is susceptible to verification..." In addition, Agency guidance on program performance indicators use the test of "reasonable attribution." The Mission's position is that the IMS performance indicator used meets these requirements, is recognized by irrigation experts, and continues to be valid despite the audit's unwarranted criticism.

USAID Handbooks, PRISM guidance, and evaluation principles do not require quantifiable attribution of project outputs to the project purpose. Furthermore, Near East Bureau's Manual for Program Planning and Performance Measurement and Reporting states "Attribution expresses the idea that a direct causal link can be made between the achievement of an objective and the resource allocation. It can be extremely difficult to do this, and neither the Near East Bureau nor CDIE are interested in tackling causality or trying to assess the portion of results for which AID resources are directly responsible, at the strategic objective level." Development theory and widely accepted irrigation practices confirm that the indicator is a reasonable measure of change in performance of the Nile irrigation system and that elements of IMS are exactly the kinds of interventions one would try in order to maintain or improve system-wide efficiency.

Recent Agency efforts to measure performance led the Mission to move to a single indicator of water use efficiency for the whole project. Difficulties in retro-fitting a massive, 14 year old project with a single cost-effective indicator are quite evident. Given this history and the points elaborated in Annex II, the revision of the indicator as recommended would not lead to any increase in plausibility or verifiability. Nor is it necessary to revise the indicator to determine how components not yet completed contribute to the project purpose; this can be done easily using the current indicator. Moreover, a revised indicator would not help in determining whether further investment in a follow-on project is warranted, since USAID/Egypt has already decided not to invest in a stand-alone follow-on irrigation project. For these reasons, Recommendation 1 should be closed upon publication of the audit report.

THE MISSION RESPONSE TO RECOMMENDATION NO. 2:

Recommendation No. 2: We recommend USAID/Egypt conduct the analyses required by USAID Handbook 3 to determine if further funding of the Survey & Mapping and Professional Development components is justified.

Response: The Mission decided prior to initiation of this audit that the Survey and Mapping (SM) component had met its objectives and required the GOE to fund 100 percent of the local operating budget for this component. In 1993 and again in 1994 the Mission advised the GOE in writing that it would not provide additional support for this component (See Annex III).

The audit report criticizes USAID/Egypt for investing the funds it did into the SM component rather than simply acquiring the maps for the GOE at far less cost. This criticism ignores the fact that IMS needed to strengthen the MPWWR's institutional capabilities in map-making for irrigation purposes. Simply acquiring a set of maps would have provided a product which would have quickly become obsolete. USAID/Egypt's approach on SM was not only consistent with the project purpose and goal, but was also designed for the long-term sustainability of Egypt's irrigation system.

The audit incorrectly states that required analysis was not done prior to initiating the Professional Development (PD) Component. In fact the IMS Project Paper Amendment 2, Annex F, page 71 refers to a detailed assessment of the Ministry of Irrigation's training needs and a report that was issued on February 20, 1986. This report was included as Annex S to PP Amendment 2. The report is titled "Training Needs Assessment for the Ministry of Irrigation Arab Republic of Egypt"

The report is comprehensive and recommends "Upon weighing the advantages and disadvantages of a National Irrigation Training Institute, it is the judgement of the Assessment Team that such an institute is fully justified and recommends that the Ministry proceed promptly to establish it". Furthermore, section F. Cost Effectiveness, stated that "...one would expect an Internal Rate of Return for this project to not be less than for education generally, i.e. at least 20-25 percent."

The last USAID-funded technical assistance support for the Professional Development component ended prior to the start-up of this audit and the remaining local operating budget support from IMS will end September, 1995. Given these decisions, which are fully documented in Annex III the Mission recommends that with the publication of the audit this recommendation be closed.

CONCLUSION

The Mission is troubled by the quality and disturbing tone of the audit report for the following reason: an inordinate amount (over 600 hours) of Mission staff time has been consumed at taxpayer expense on this audit activity while providing minimal, if any, new information to improve accountability and decision-making. The time spent trying to "educate" the auditors would have been more productively spent on the analyses and assessments the Mission was in the process of carrying out, and has since completed, to document lessons learned from IMS and their implications for irrigation development in Egypt.

ANNEX ONE

**IRRIGATION MANAGEMENT SYSTEMS CHRONOLOGY AND FUNDING LEVELS
(OBLIGATION TIME LINE BY FISCAL YEAR, LOP FUNDING, AND AREA
SERVED)**

BY COMPONENT

IMS COMPONENT	F Y	8 2	8 3	8 4	8 5	8 6	8 7	8 8	8 9	9 0	9 1	9 2	9 3	9 4	9 5
Plan. Studies & Models (PSM)		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Proj. Prep. Depart. (PPD)		X	X	X	X	X	X	X	X	X	X				
Structure Replacement (SR)		X	X	X	X	X	X	X	X	X	X	X			
Preventive Maintenance (PM)					X	X	X	X	X	X	X	X	X	X	
Irrigation Improvement (IIP)								X	X	X	X	X	X	X	
Miscellaneous								X	X	X	X	X	X	X	
Survey & Mapping (SM)									X	X	X	X	X	X	
Water Research Center (WRC)									X	X	X	X	X	X	
Main System Mgt. (MSM)									X	X	X	X	X	X	
Professional Develop. (PD)									X	X	X	X	X	X	

²U.S.\$ millions of USAID funds. Total = \$336 million.

³Area in thousands of *feddans* (0.42 ha) improved or influenced by IMS Components. The entire cropped area is approximately 7,200,000 *feddans*.

⁴Number of engineers trained. There is no reliable estimate of the relationship between engineers trained and areas improved.

EXPERT VIEWS ON INDICATORS: Citations From Development Literature to Support the Mission's Choice of Purpose-Level Indicator for the IMS Project
(Estimate of \$1.0 million in item no. 3)

1. **Ramesh Bhatia and Lalith Dassenaille.** 1995. Quantification and Measurement of Minimum Set of Indicators of Performance of Irrigated Agriculture (Draft for Discussion). International Irrigation Management Institute. Colombo.

The approach taken in this paper assumes that "the performance of many systems cannot be evaluated in relation to management targets, or internal indicators, because actual operation is substantially at variance with what is officially planned External indicators would attempt to estimate the interactions between the system and its surroundings and may still have value." (p. 1) The authors concluded that **"the single "external" indicator that will tell us most about system performance [is]: What is the net value of agricultural production per unit of water consumed from the hydrological cycle? This indicator summarizes the contribution of the irrigation activity to the economy, and desegregated in time and space, can also show trends, equity, and farm impact."** (p. 2) They describe the **"simplest estimate - gross value of production per unit water diverted and/or lifted."** (p. 3)

2. **S.C. Hsieh and V.W. Ruttan,** 1967. "Environmental, Technological, and Institutional Factors in the Growth of Rice Production: Philippines, Thailand, and Taiwan". Food Research Institute Studies, Vol 7, No. 3.

In comparing rice yield data for the Philippines, Thailand, and Taiwan, Hsieh and Ruttan have shown that **differences in aggregate yields across regions may depend more importantly on differences in the quantity/quality of irrigation available and other environmental factors, and less importantly on such factors as new varieties, better cultural practices, or more intensive use of technical inputs such as fertilizer.**

3. **Jack Keller.** 1995. Personal Communication. USAID: Cairo.

"The Imperial Valley Irrigation district, which is a 500,000 acre irrigation district receiving water from the Colorado river, is selling water to the Metropolitan Water District of Southern California (MWDSC), which supplies water to 37 million people. MWDSC is paying \$100 million plus to transfer 100,000 acre-feet, or 123 million cubic meters of water saved. The transfers cannot take place unless it can be proved that the water being transferred was in fact saved and not merely taken away from some

other authorized use.

Verifying water savings in this project costs over \$1.0 million, or about 1 percent of the cost of the water. It would have been possible to put systems in place to prove that IMS achieved its purpose but it is highly unlikely U.S. taxpayers would have considered the cost justified."

4. **Yitzhak Kiriati, 1994. "Israel Report - Israel: A Growing Success" in INTERPAKS DIGEST, Vol 2 No. 2&3, Summer/Fall 1994.**

Kiriati reports on the successes of Israel's investments in "the development of an agricultural infrastructure, including a national water carrier and other water resources" in terms of "a fall in agricultural fresh water needs over the last 20 years. Crop sales have registered high profits, and **yields from one cubic meter** of water rose from US \$0.46 in 1950 to US\$2.04 in 1990."

5. **P.S. Rao. 1993. Review of Selected Literature on Indicators of Irrigation Performance. International Irrigation Management Institute. Colombo.**

"For mixed crops, productivity needs to be expressed in monetary terms, i.e., dollars/ha or dollars/m³ of water. These indicators are easier to compute from generally available data than the indicators of water delivery performance." (p. 59)

"Focusing on systems in which water is the scarce resource, annual yield per hectare and the productivity per unit of water delivered at the head of the system give a good picture of the performance with respect to production....Agricultural production information can thus be used as a powerful screening device, as well as for long-term performance monitoring." (p. 59)

Rao concluded that "A PRINCIPAL OBJECTIVE of the current studies on performance assessment is to facilitate the development of a consensus on a limited set of performance indicators that irrigation agencies concerned with irrigation management in developing countries could incorporate in their monitoring and evaluation and also in their research and development efforts to improve irrigation performance." He goes on to describe two considerations for choice of indicators: "the set should provide adequate information to assess over seasons and years the performance of the water delivery system, agricultural production, and returns to farmers and the broader economy without excessive demands on data collection and hence cost of obtaining the information.;... the set should contain as few indicators as possible." (p. 63)

One of the recommended indicators for performance of the irrigated agriculture system was: **"Yield per unit water."** And **"In the case of diversified cropping systems, the productivity values will need to be expressed in monetary terms;..."** (p. 64)

6. **Cynthia Rosenzweig and Daniel Hillel.** 1994. "Egyptian Agriculture in the 21st Century." Collaborative Paper for the International Institute for Applied Systems Analysis. Laxenburg.

"Egyptian agriculture is entirely based on irrigation and hence is utterly dependent on a tenuous balance between the supply of water (from the Nile, and to a lesser degree from groundwater) and the demand for it by crops." (p.1) The authors characterize agronomic water use efficiency, defined as **the economic yield obtained per unit volume of irrigation applied, as a truer measure of the productivity of irrigated agriculture** than either field water application efficiency (fraction of the water applied that is consumed by the crop in transpiration in a given field) or system water application efficiency (fraction of the volume of water taken from the source that is used consumptively by crops along the entire irrigation district or region. (pp. 10-11)

7. **R. Bhatia, Upalia Amerasinghe and KAUS Imbulana.** 1995. "Productivity and Profitability of Paddy Production In the Muda Scheme, Malaysia." in Water Resources Development, Vol 11, No. 1.

"The Muda irrigation scheme in Malaysia is one example of an effort to improve water-use efficiency in irrigated agriculture with a view to producing "more food with less water". p. 42
"Productivity gains in the Muda scheme, over time, have been analyzed using the following indicators: gross irrigated area per year; total production of paddy over time; paddy output per hectare per year; and **paddy output per million cubic metres of water released/supplied.**" p. 43 Their study concluded that "a combination of favourable policy environment and a supportive irrigation bureaucracy which enabled farmers in the Muda irrigation scheme to increase total crop output during the 1980's..." (p.58)

8. **Leslie E. Small and Mark Svendsen.** 1992. A Framework For Assessing Irrigation Performance. Working Papers On Irrigation Performance 1. International Food Policy Research Institute: Washington, D.C.

"Evaluation of irrigation performance in terms of water deliveries minimizes the confounding influence of other non-irrigation variables. "One must consider the types of inputs to be used in the denominator of the efficiency measure. The

amount of water diverted or released into the head of the irrigation system is one possibility and leads to efficiency measures that can be interpreted in terms of traditional concepts of water use efficiency." (p. 28)

9. **Addel-Wahab M. Amer and Abdallah S. Bazaraa.** 1993. Development of Key Performance Indicators For The Irrigation Management Systems Project. Final Report. Ministry of Public Works and Water Resources: Cairo.

"The overall goal of the Irrigation Management System Project is to increase the agricultural production and productivity through better management and control of the available irrigation water. Implied in these goals are the needs to improve yield levels and water use efficiency. The two parameters are inter-related. Poor water delivery and irrigation application efficiency may lead to some unfavorable effects resulting in lower yield per unit of area and per unit of water, less total area irrigated, and detrimental environmental effects, as well as lower returns from the irrigated crops." (p. 12)

Efficient control and use of water would free extra amounts to be utilized for extending the cultivated area or to allow shifts to new crop varieties that increase the grower returns. The following derived indicators reflect the efficiency of using the water in economic or absolute terms...**Indicator (1) reflects the value of agricultural production per unit of water used (LE/m³) = Value of the Agricultural Production /Quantity of Water Used....**Again, agricultural production is not only a function of the irrigation effectiveness, but it does depend largely on other agricultural inputs." (p. 18)

**REFERENCES FROM OFFICIAL DOCUMENTS:
That Support the Mission's Comments
on the IMS Project Performance Audit**

IMS Impacts on Overall Irrigation System Efficiency

1. James M. Webb. Analysis of the Structure Replacement Project Egypt. Paper prepared for USAID/Cairo. 1992.

The author analyzed the impact of the IMS Structure Replacement (SR) in the Sharkia Governate and found "a reduction in water use of approximately 11 percent since the start of the project. As a result of this program and other corollary improvements a fertile area in the delta was able to increase its agricultural base from 580,000 *feddans* to 850 *feddans* an increase of 46 percent." He goes on to conclude that "considering that cropping patterns, market influence, cropping intensity and varying water conservation efforts have not been evaluated as to their influence on the results, a conservative figure of 5.5 percent is applied to the irrigation system which equates to approximately 2.0 billion cubic meters of irrigation water saved annually throughout Egypt's irrigation system as a result of the Structure Replacement Project."

2. Carl G. Maxwell. Portfolio Review of Structure Replacement Project. Memorandum. USAID/Cairo. 1992.

Reporting on project status Maxwell noted "there are a few concrete indicators illustrating the affect this project has had on increasing the efficiency of the irrigation system and improving agriculture outputs through increased lands being put into production as a result of water savings." In referring to the findings by Webb (see no. 1, above), he stated that the overall savings of water in the main system "is measured observing water levels at major control points. The water level in the irrigation system over the last 8 years has been able to be reduced to serve the same agriculture area (6.0 million *feddans*) as a result of increased efficiency of irrigation structures to hold and control water use." And finally "increased efficiency of the system enables use of the savings in water in new lands which equate to increased agriculture output...."

Mission Decisions Leading to Limited Increases in the IMS LOP For The Survey & Mapping (SM) Component

1. Carl Derrick. Information Memorandum For The Files. USAID/Cairo. 1993.

Survey and Mapping (SM) was discussed in terms of the technical

justification for the cadastres and its contribution to project purpose and sustainability of the Egyptian Survey Authority (ESA). "Rather than continuously fund local operating costs through LOP for SM component, Director Bassford directed that the requested increase in project funding be conditioned upon MPWWR providing its own financing for all ESA local operating costs required by the SM component...and no further funding will be provided to ESA for local operating costs effective August 31, 1993."

2. Gamil Mahmoud. GOE Funding of ESA and the IMS Survey & Mapping (SM) Project. Letter to Acting Director Christopher Crowley. Cairo. 1993.

Following the Mission's decision on local operating support for SM the GOE advised by letter that "the Ministry of Planning has allocated L.E. 7.9 million to be available for the GOE contribution for the components of the IMS project during FY93-94." and "I trust that the actions of both the Ministry of Planning and MPWWR will convince USAID of the GOE's interest in continuing the IMS-Survey and Mapping component until June 1995; as it presently agreed, and that the GOE, MPWWR, and ESA are doing their best to ensure this component's sustainability thereafter."

3. Donnie Harrington. Justification for Increased Funding for SM. Memorandum to AD/AGR. USAID/Cairo. 1994.

Memorandum describes SM progress in meeting project output targets and justifies final tranche of USAID funding through July 31, 1995. "We have no plans to provide support for survey or mapping under the new Water Resources Management Project."

4. Donnie Harrington. Irrigation Management Systems Project Implementation Letter No. 92, Amendment No. 17. to Engineer J. Mosaad Ibrahim, ESA Chairman. USAID/Cairo. 1994.

This was the final no-cost extension of the USAID/Cairo funded technical assistance contract to September 21, 1995.

5. Clemence J. Weber. No cost Extension of Geonix Contract. Letter to Engineer Mosaad Ibrahim ESA Chairman. USAID/Cairo. 1995.

In response to a late request to reconsider its decision not to extend SM the Mission informed the ESA Chairman that "we have reassessed our plans to conclude assistance to the Survey and Mapping (SM) component of the Irrigation Management Systems (IMS) Project and have decided not to support an extension of the Geonix contract." And "...firm commitments have been made within USAID to terminate some components of the IMS Project, including

SM, in September 1995. Accordingly, unexpended funds that have been earmarked for SM and other components scheduled to end in September 1995 are needed for the completion of activities to which USAID has assigned the highest priority and are planned for the IMS extension period."

6. Mosaad Ibrahim. Letter to Ambassador Walker. Egyptian Survey Authority. Cairo. 1995.

In transmitting a copy of the recently completed Strategic Plan for the Egyptian Survey Authority Mr. Ibrahim stated "The completion of this plan marks the conclusion of Phase One of our Modernization Program..." He thanked the American people for "your generous support" and declared that "Without that support our Strategic Plan and all that it represents would not have been possible. Your government's support has materially improved our ability to supply the GOE and the people of Egypt with the maps and digital geographic data so badly needed to support the development of our beloved country. Your support has also given us a running start on the completion of our national cadastre, a program sorely needed to secure unambiguous land ownership, equitable land taxation, orderly land transfer and more rational environmentally conscious land use." In terms of sustainability of USAID's investment in SM he noted "We are committed to going forward with implementation of the Strategic Plan as evidence that the substantial investment made in our Authority by both the GOE and the USG has been well used and will continue to bear fruit in the years ahead."

Sustainability of IMS Investments in the Professional Development (PD) Component of IMS

1. Flynn Fuller. Professional Development (PD) Component Conditions Resolution for Continued Support. Memorandum to IMS Project Committee. USAID/Cairo. 1992.

Project Officer Fuller described PD as "designed to support the IMS Project to improve the management and operating efficiency of the irrigation delivery and drainage system. PD institutionalizes a multidisciplinary training program to serve the MPWWR's manpower training and development requirements. The Program is expected to provide continuing education and training for about 2,500 managers, engineers, and technicians annually." He mentions the September 1990 IMS Evaluation, which "recommended to extend PD support to 1995." Consistent with the Missions comments to the auditors "It was envisioned that PD would develop the capacity to serve the entire training needs of the Ministry." The MPWWR has over 80,000 employees of which at least 18,000 are engineers and middle managers.

Mr. Fuller also reported conditions the Project Committee agreed

the GOE should meet before additional USAID funds would committed for PD. One of these conditions was that "MPWWR must provide an Operation and Maintenance budget for the GOE 1992/93 fiscal year, (and agree to include increases in future yearly budgets as appropriate, and assume the full responsibility for O&M costs by 1995/96)."

2. Gamil Mahmoud. Irrigation management Systems Project Professional Development Component (PD) USAID Continuing Support. Letter to USAID/Cairo. 1992.

In response to USAID conditions required in Project Implementation Letter No. 129, Mr. Mahmoud, as Head of the Planning Sector & Chairman of the IMS High Coordinating Committee, advised the Mission that "At the conclusion of the Project, MPWWR will assume full support of the operating budget of the Center [National Irrigation Training Center]."

3. Irrigation Management Systems (IMS) Project Paper Supplement No. 3. USAID/Cairo. 1993.

"The PD component began in 1982 utilizing whatever MPWWR staff, facilities and organizations could be made available. The 1987 amendment provided for assistance to establish the National Irrigation Training Institute (NITI) and provide it with facilities, equipment and staff. This phase of the component began in 1989 with assistance of a host country contract team providing TA, training and procurement services. To date more than 7,600 MPWWR staff have been trained in planning, design, construction management, quality control, operations maintenance and water management through both off-shore and in-country events. Most of this has occurred during the past three years. Phase out from this component is scheduled for March 1993 (TA contract end date) with diminishing support (operation and maintenance until 1995)."

Extension of IMS Components Beyond September, 1995

1. Russ Backus. WRM Project: Meeting with Engineer Gamil Mahmoud. Memorandum. USAID/Cairo. 1995.

Project Officer reported on a meeting in January, 1995 with the Chairman of the IMS High Coordinating Committee. It was the Chairman's opinion "that only three IMS components will require extension: Main System Management, Irrigation Improvement, and Preventive Maintenance." The Chairman "intimated that although requests for other component extensions may be received, they should be quickly dismissed."