Irrigation Performance Assessment in Thailand

- Problems of Monitoring and Evaluation

Armin Rieser, Uni Bonn & Sabine Höynck, Fachhochschule Köln

1. INTRODUCTION

The management of irrigation systems in an environment of increasingly scarce water is getting more and more complex. System managers of large scale public irrigation systems face the problem of being confronted with influential groups who demand to fulfill different objectives. Generally, the government demands to use the scarce water most efficiently for agricultural production. Water shall only be used up to the quantity when the marginal benefit from water use is not lower than the value of water use in a different sector or area. The individual farmer is not concerned with the costs for water as long as he does not pay a water price representing these opportunity costs from other potential water use. He tries to maximize his income from the resource that is scarce for him which is usually irrigable area.

An objective of all parties interested in the use of water is to not waste it by not using the irrigation system properly. To keep control over the functioning of the system the irrigation process has to be controlled. The influential parties with different objectives can be convinced of the correctness of the activities if they participate in the planning stage and if the irrigation management process is transparent and the agency is accountable to all groups.

Control, transparency and accountability can be achieved by incorporating the management tool of Monitoring and Evaluation (M&E) into the irrigation management process.

Practical problems in the application of M&E arise from the choice and use of performance indicators. The right indicators have to be chosen, meaning those that are describing relevant aspects of performance and that are clearly indicating the state of performance and the need for action. Some indicators are ambiguous (Figure 1).

Examples for the difficult use of indicators are drawn from a case study of a large scale irrigation system in Thailand (Phitsanulok Irrigation System). As examples for socio-economic performance the indicators *yield* and *farm income* will be discussed.

Figure 1: Model of Irrigation Systems Showing Inputs, Outputs, and Impacts

2. Monitoring and Evaluation in Development Project Management

M&E has been generally accepted as the most important tool to control the management of developing projects. It consists of two components. As a precondition for its application a transparent management process is required. Transparency in management includes the formulation of objectives and the operationalization of those objectives by steering the project activities towards targets.

Monitoring is conducted under the assumption that fulfilling the targets leads to project success. The project manager should clearly know whether the project is performing as planned by observing the development of the indicators' values for those targets and by comparing the actual to the planned values in a continuous process. In case of significant deviations of actual from planned values the project manager can react by ordering activities to correct the processes (BRÜGGER, A. P. 1997).

Evaluation is the analytical component of M&E. Analyses of the project processes and impacts are conducted to test whether the planned activities can lead to achieving the objectives, or whether a modification of the targets is necessary. An evaluation should not only be concerned with the processes and impacts directly involved in the project but it should also consider impacts on the project's natural, economic and social environment. Evaluation requires to look at the project's result from a period of activities. It is conducted periodically (CASLEY, D. J. & K. KUMAR 1987).

The advantage of M&E as a tool in the management of developing projects is that it requires transparency. Thus, donor organizations, counterparts and beneficiaries can get an insight into the process, activities can be explained in their objective-orientation and individual's decisions can be controlled in terms of conformity with the project objectives. With the latter, the donor organization can keep control over rent-seekers in project management, e.g. from public institutions of the receiving country.

The degree of control through M&E relies on many factors starting from defining objective and planning processes. With a highly formalized process to plan development projects under participation of donors, counterparts, representatives of involved public institutions and of the beneficiaries a high degree of transparency can be achieved. An example for formalized planning is the use of a logical framework. [*]

[*] The GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH) is applying such a planning tool, the ZOPP method (Objective Oriented Planning of Programs and Projects). In a logical framework the targets are listed as referring to the objectives, values for the targets within their time frame are given, sources to monitor the target achievements are searched for, and to avoid misunderstandings among the cooperating participants, the assumptions are listed which underlie the estimations of the targets

Figure 2: Inputs and Outputs: Irrigation in the Context of Nested Systems

The problem of the formalization in project planning is the lack of flexibility. Complex projects or those that are influenced by a wide range of uncertainties are difficult to squeeze into the restricted dimensions of a logical framework. Project objectives with material output are much easier to define clearly than immaterial objectives. Complexity requires to define a huge set of targets by widely omitting the interactions of the measured factors.

A M&E system based on many targets is threatened to get stuck in a wide data collection producing data cemeteries. Reaction to the monitored values is hardly possible in time. Without priorities and with insufficient knowledge of the interactions in the project makes it difficult to react when several indicators do not have the targeted values.

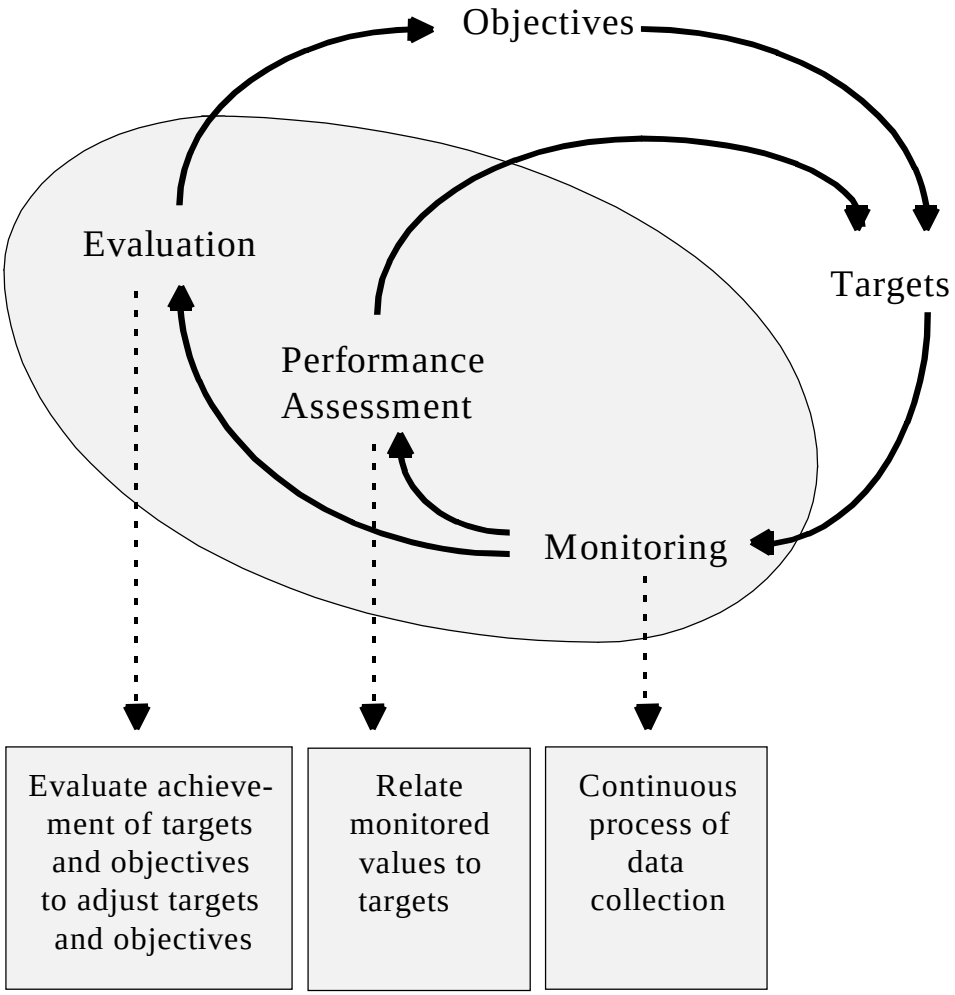
Planning target values for uncertain projects is quite difficult. A-priori definition of critical trade-offs in monitoring are not clear because they depend on the situation developing around the project activities. In a project with material and immaterial objectives arises the risk of bias towards the material objectives. Because material outputs are much easier measured, M&E concentrates on them in steering the project. Meanwhile, the project might be lacking to fulfill another important target, e.g. participation and motivation of beneficiaries, without being noticed.

3. M&E in Irrigation Management

It makes sense to transfer M&E as a tool for development project management to irrigation management in the case of a former development project because of the following reasons:

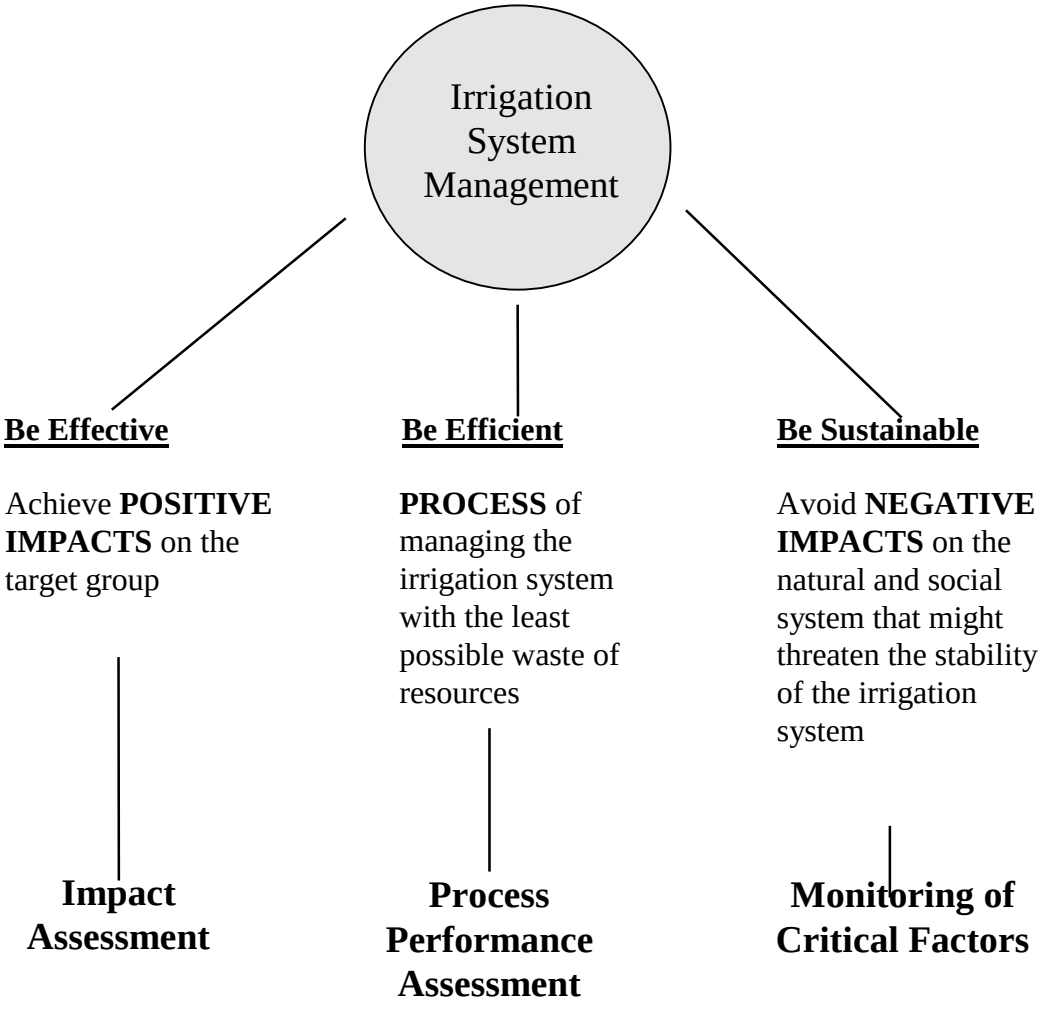
- Irrigation managers who take over a system that had been installed through a development project are familiar with M&E to control the management process.
- Irrigation system management should use a tool for control that guarantees transparency and accountability to all involved parties, firstly the irrigation agency and the water users, but also to other external parties, like national governments or supporting development organizations.
- For the control of operation and maintenance of an irrigation system, M&E can use a wide range of indicators in the monitoring process which have been developed by development agencies. Irrigation systems transform inputs stepwise to the final outputs. It is possible, to measure the outputs at each transformation step and relate those as indicators to an activity (SMALL, L. E. & SVENDSEN, M. 1992).

Figure 3a: Control in the Management Cycle



Based on: MERREY et al. 1994

Figure 3b: Objectives in Irrigation Management



Using M&E in irrigation management does not always work as nicely as it should. Managers from the irrigation agency, who have learned to use M&E during the phase as a development project from project managers, might not like to continue using it, maybe because they feel controlled themselves. The execution of M&E requires resources. All parties financially involved prefer to save money and time which is a temptation to not properly follow a monitoring routine.

Another type of failure besides non-acceptance is the danger of administrating the irrigation system - including M&E - instead of managing it based on information. This happens when the irrigation agency continues data collection as initiated by a donor organization without having the capacity to transform this information into action. This problem is rooted in the fact that M&E systems by donor organizations are not tailored for the continuous use in irrigation management (HÖYNCK, S. & RIESER, A. 1996). Monitoring activities might go far beyond the bundle of information that the manager needs to steer the water delivery.

Besides the minimum information to operate the system, there is also requirement of information for water allocation planning under maximum consense among the water users. The individual water user should contribute resources to system's O&M. Therefore, he is in the role of a customer of the irrigation agency who has a right on information about the agency's activities.

The challenge in developing a M&E system in irrigation management is to reduce the number of indicators to an manageable quantity without neglecting important aspects (RIESER, A. 1989). A reduction of information at the central decision-point in irrigation management could be achieved by channeling the monitored data to those in the transformation line, that are responsible for controlling the process of the relevant transformation step (see Figure 2).

In irrigation system management, M&E shall be used as an action-oriented information system. Compared to M&E in development project this requires a much closer linkage of the monitored values to the performance of an acting unit. In this context, recent literature is dealing with the problem of irrigation performance assessment, which could be described as a more management-oriented version of M&E. The expression "performance assessment" stresses the aspect of performance orientation. The position of M&E or performance assessment in the management cycle of an irrigation system is shown below (Figure 3). The irrigation management can be controlled by continuously monitoring the

relevant factors for successful management and by assessing performance through comparison of monitored actual values to the targets. In the broader view, the target achievement must be evaluated to adjust objectives and targets to the actual situation that might be different than assumed during the planning stage in performance assessment.

4. Socio-Economic Aspects of Irrigation Management

This expression is connecting the economic with the social aspect. A pure economic approach would tempt decision-makers to manage the irrigation system without sufficiently considering the social impacts on farm level and the social impacts or performances of individuals from different groups in their interaction. The social systems of farm-households, farmers groups, irrigation officers or others, e.g. women's self-help group, are important factors for the economic performance of the irrigation system.

The family and income structure of the farm household determine the potential resource allocation of the farm in irrigated farming and irrigation system O&M. The group cohesion of farmers sharing water, the social role of a group leader and the knowledge about water management are conditions for a regulated sharing of scarce water. The relationship of water users with the irrigation agency at the diverse interfaces sets a frame for the potential of optimizing system's O&M in cooperation and discussion with the water users.

Agency staff can play a vital role in supporting farmers' organization as a consultant or authority in case of water conflicts. The activities of irrigation officers at this level are very important from economic point of view, but hardly assessed or recognized. If there was a way of improving the assessment of social performance at the interface with farmers it would be easier to give incentives for more social engagement to the agency staff.

A classification of social impact and social process indicators was developed by RAO (1993) (Table 1 and Table 2).

Although the need to use socio-economic indicators, there are quite a lot problems connected to their use (see Table 3) which usually leads to not monitor any social or socio-economic indicator at all. The on-farm socio-economic system is often restricted to the agricultural system using indicators like planted area, harvested area and average yield.

Table 1: Social Impact Indicators (based on: RAO 1993)

Impact Indicator	Variables to be Measured	Indicators Developed	Publication
Farmers Satisfaction	asking farmers, distribution and volumes of complaints against the agency, disputes among farmers	**FS** Farmers Satisfaction (NIA, Philippines)	GARCES 1983
		WPI Water Problem Index	UPHOFF et al. 1990
Employment Generation	number of days / ha, relative wages, farmers' income	These indicators are not irrigation-specific, they can be obtained from general literature on Monitoring and Evaluation of development projects	
Quality of Housing, Ownership of Basic Consumer Items	classes of prevailing housing styles, counting locally items typically indicating level of well-being in region		
Migration Patterns	age, gender, social and economic status of migrants, seasonal, temporary or permanent migration		
Gender Relations	work loads/access to resources, independent incomes		
Access to Resources	land tenure, availability of alternative employment		

Table 2: Social Process Indicators (based on: RAO 1993)

Complex Indicator	Factors for performance of communication	Factors for technical performance	level of performance
Response Capacity	social structure of agency, control / self reliance		agency
	process of organisation / timing	measuring equipment, expenses, timing	agency
	individual relationships / vested interests		interface individuals in agency
	individual skill	individual's decision-process	individual in agency
Degree of Farmers' Involvement	perception of openness of the agency	on-farm water use	interface agency/farmers
	experience in expressing needs		interface agency/farmers
	potentials of farming group pressure		interface agency/WUG
	potential for co-ordination within group	water distribution	interface farmer/farmer

Complex Indicator	Factors for performance of communication	Factors for technical performance	level of performance
Performance of WUG	potential of farming group pressure	decision-process of WUG	WUG
	social structure of involved social units	know-how of decision-makers	interface farmer/farmer
	vested interests of influential persons	representation of individuals	interface individual/WUG
	structure of group (individual role)	match plan with reality	interface individual/WUG
Capacity of Each Individual to Fulfil His/Her Tasks	not specified	not specified	individual

5. Case Study in Thailand - the Use of Specific Indicators

5.1 Research Approach

Phitsanulok Irrigation System is a gravity system with open, mainly earthen canals. Approximately 20.000 farms receive water for the almost 100.000 ha of irrigable land through a conveyance system that is operated and maintained by the national irrigation agency, the Royal Irrigation Department (RID). Features of the system are:

- two irrigation seasons, rainy season and dry season
- dominant crop for both seasons is lowland rice
- North-South extension 130 km, length of main canal 189 km
- water user associations: partly established at tertiary level; average 20 members, sometimes up to 100
- more than 200 farm ditches are directly diverting from main canal.

The case study area is be characterized by its long and quite narrow shape extending through three provinces. Thus, it is greatly influenced by regional differences such as distance to local centers, distance to marketing infrastructure, and social rural structure and by the different activities in rural development in the three provinces (Figure 4).
Information from this case study can be used to point ant some problems for the use of indicators arising from the social, economic and natural environment.

Figure 4: Location of the Phitsanulok Irrigation Project

5.2 Socio-Economic Indicators

5.2.1 Household Level

- Farm Income

Naturally, farm income is primarily determined by the farm size. In a comparative analysis over time the gross margin is the most adequate value because it is not influenced by the changing structure of farm sizes in the period analyzed. Additionally, the analysis of profitability and productivity of land depending on the farm size is of great interest seeing how the benefit from irrigated agriculture is distributed among big and small farms.

From the results of eight years monitoring of farms throughout the system with comparable investment in irrigation infrastructure the conclusion can be drawn, that the price for paddy is the one of the most sensitive factors for farm income. The development of gross margins per unit planted area is following the price fluctuation. In contrast to the price, the fluctuation of wet season yields is sometimes opposite to the gross margin development. This means, that the farm income is more sensitive to price fluctuation than to yield fluctuation (Figure 5 and figure 6).

- Yield

To measure yields is one of the most important indicators to keep control over the transformation process on farm level. Problems in data collection do usually not lie in the figures given by interviewees but in the method of data collection. A common way is that the field staff interviews some farmers that he meets in the field by chance. It is much more comfortable to interview farmers that can be easily seen in the field, which are usually those close to the roads which are usually close to the inlet of a tertiary canal. Consequently, tail-enders are under-represented by this simple method.

Yields are usually referred to from the fields that are harvested. This is a very important indicator for the potential productivity of the land. Yields should also be analyzed in relation to the planted area, because this is a measure for the income generation on farm level and the risk in agricultural production depending on the cropping intensity and losses (Figure 7).

Table 3: Problems in Using Socio-Economic Indicators in M&E (Household Level)

	Socio-Economic Indicator ***(SEI)***	Complexity	Accountability	Ambiguity
HOUSEHOLD LEVEL	*Household Income*	result of interaction between social and economic system on farm, a wide range of external factors	too many factors to relate to specific activities of the irrigation agency	reliability of data collection
	Farm Income	same as *Household Income*, but less influence from external factors, high influence of product price	depends on degree of dependence on irrigation system for agricultural production; might be based on illegal O&M or on the use of other sources or even without using the irrigation system	reliability of data collection; division of farm income from household income; evaluation of internal processes; household consumption
	Yield	same as *Farm Income*, but less interaction of social and economic system; influence of prices less and with time lag (intensity depending on expected price)	same as *Farm Income*; in case of different products difficult to compare	sampling method
	Employment in Irrigated Agriculture	depends strongly on external factors; interacts with *Migration Patterns; Gender Relations*	overall indicator for system performance; difficult to relate to specific irri-gation activities	can generate more work for farm household in a positive and negative sense; compensated through mechanization
	Migration Patterns; Gender Relations	same as *Employment in Irrigated Agriculture*, choice of indicator depends on regional problem to be solved by irrigation activity	migration is the result of regional development; the contribution of an irrigation system is not always clear	seasonal migration or exceptional migration is quite difficult to classify in its impacts
	Farmers Satisfaction	interacts with other factors besides water delivery: alternative water sources; social system; land use potential	difficult to relate to specific irrigation activity (see example tubewell)	reliable way of data collection: strong influence of interviewer, or, strong influence of “strong” farmers; no independent way to measure
	Farmers Motivation	interacts with *Household* and *Farm Income, Farmers Satisfaction* and *Farmers Involvement* in *System Management*	can only be related to activity if motivation had been formulated as an objective	no independent way to measure

Figure 5: Relationship between Gross Margin for Wet Broadcasted HYV Paddy and Yield - Wet Season 1982-1990

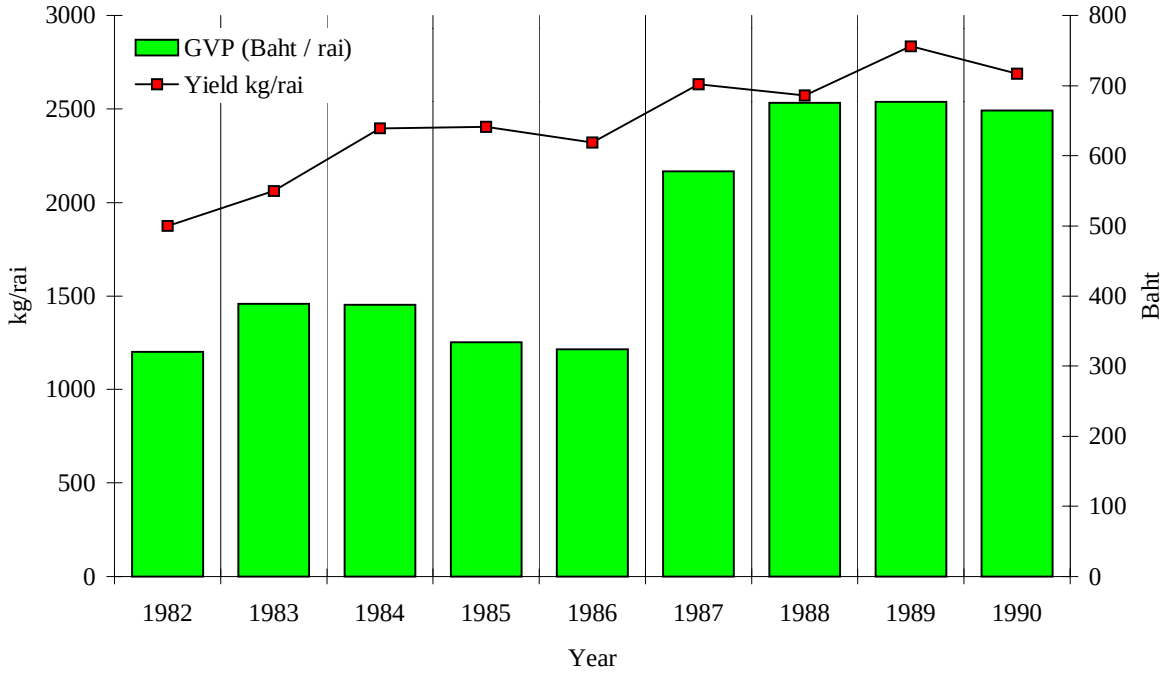


Figure 6: Relationship between Gross Margin for Wet Broadcasted HYV Paddy and Price - Wet Season 1982-1990

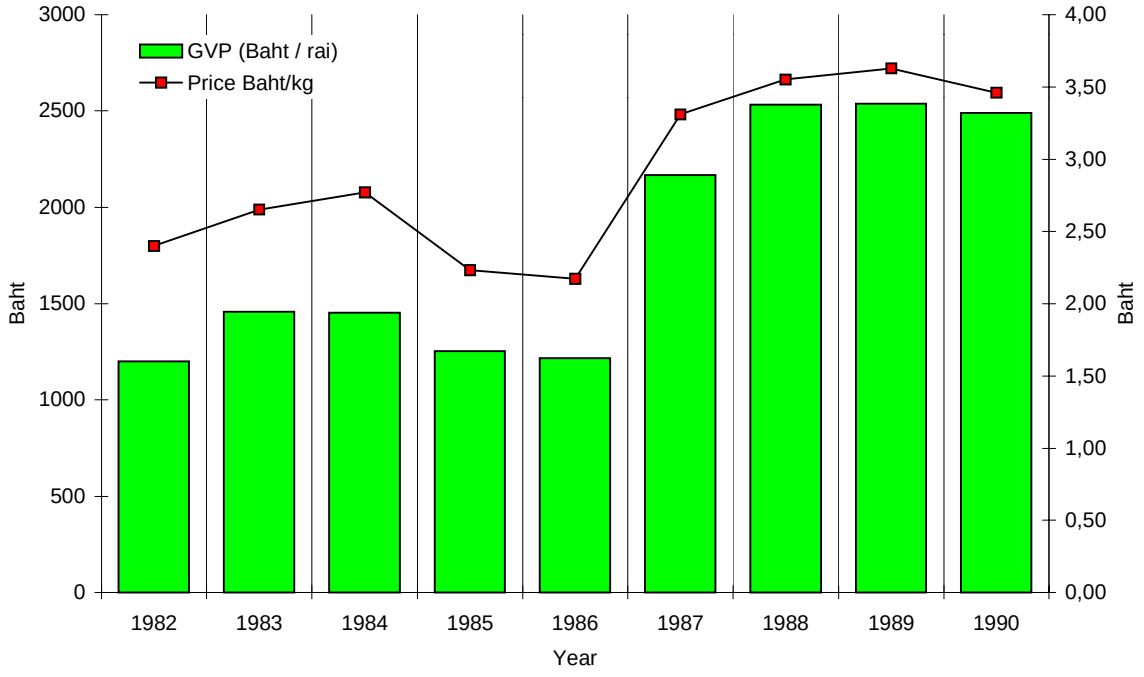
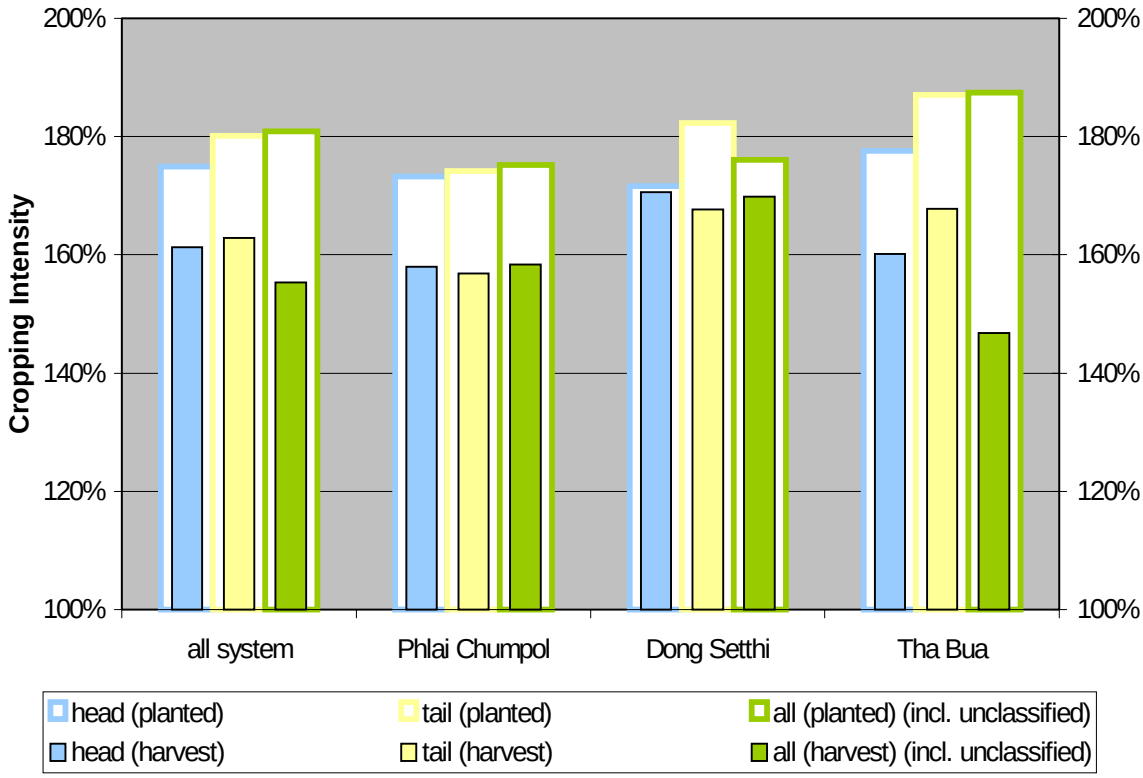


Figure 7: **Comparison of Cropping Intensities from Planted and Harvested Areas in the Head and the Tail Reaches of the Farm Ditches in the Sub-System of Phitsanulok Irrigation System (1995/1996)**



To evaluate the quality of water distribution by using yields they have to be compared among different groups of farmers, usually divided into water users from the head, middle or tail of an irrigation system or one canal.

The Phitsanulok irrigation system is divided into three sub-projects, which might represent the regions mentioned above. The "middle" sub-system should rather be described as "tail" systems because it is provided with water from two long secondary canals (37,5 km and 81,7 km) that branch off the main canal 10 km above the border to the real "tail" sub-project.

5.2.2 Community Level

Table 4: Problems in Using Socio-Economic Indicators in M&E (Community Level)

	SEI	Complexity	Accountability	Ambiguity
COMMUNITY LEVEL	*Involvement in System Management*	depends on farmers motivation and on openness of irrigation agency or cohesion of local group; also depends on the need for integration	responsibility for involvement from 3 sides: farmers themselves, local group, irrigation agency;	difficult to compare different areas
	Social Structure	strongly depends on external factors; trend of rising individualism in "modernizing" societies; age- and household structure of community	role of irrigation conflicts and community effects through irriga-tion must be separated; difficult to assess role o irrigation officer in social development	can only be described by maybe using some key figures, comparison with outside irrigation system necessary, but additional need to consider regional differences within irrigation area.
	Effectiveness and Legitimacy of Farmers Organization	*Effectiveness* strongly interacting with *Social Structure* and farmers motivation; (which depend strongly on regional factors)	*Legitimacy* usually outside of responsibility of irrigation agency; difficult to extract role of irrigation officer	measure results of what farmers organizations are responsible for (low-conflict water distribution; maintenance; representation of farmers): might be successful without full participation or organized differently or based on non-complaining weak disadvantaged farmers. Measure rate of membership, participation in meetings, activities of group: might be other social structure that is doing the work efficiently.

5.2.3 Agency Level

Table 5: Problems in Using Socio-Economic Indicators in M&E (Agency Level)

	SEI	Complexity	Accountability	Ambiguity
AGENCY LEVEL	*Response Capacity*	Ability of staff to react to daily situation in planning and execu-ting operation depends on the clear-ness of his field of responsibility and the information available	in a very steep hierar-chical organizational structure the individual might reduce his res-ponsibility to follow orders instead of res-ponding to situations; for a responsive man-agement information must be used at the res-pective transformation level; this way, R*es-ponse Capacity* might be useful as an indicator	should be measured to assess work of individual in irrigation agency; might be used as a control measure by superiors which might influ-ence staff positively in the monitored field but very negatively in all other, e.g. in cooperation among officers; performance assessment of the individual should rather be used as a positive incen-tive

Communication could be the key to improve the response capacity of an agency (Figure 9).

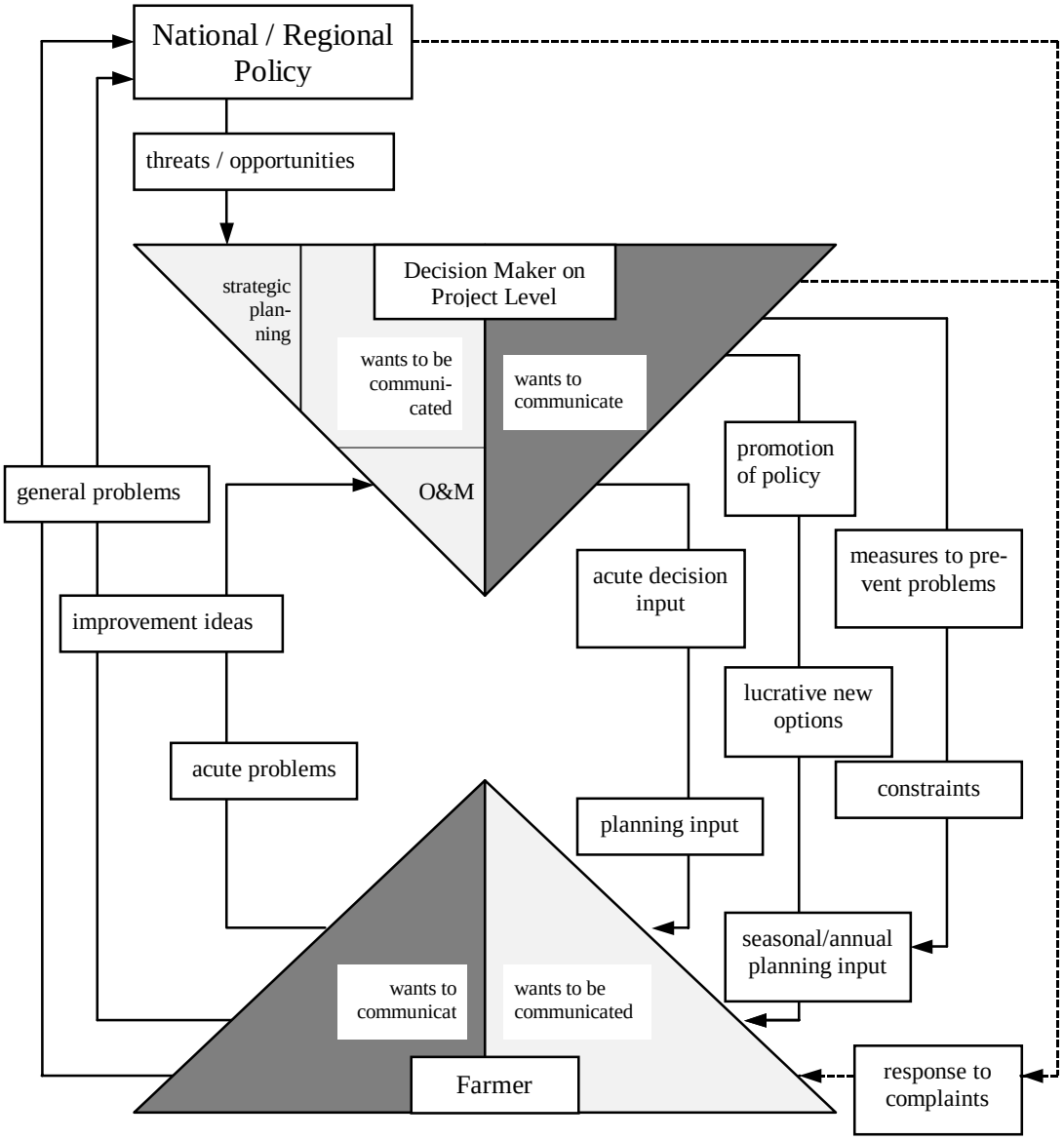
6. Summary

Performance assessment is a tool to be applied in the management of large-scale irrigation systems. The case study approaches to the socio-economic aspect as part of the research project entitled: “Systems Analysis for Irrigation Performance Assessment”. The case study addresses the management of a Phitsanulok Irrigation System in the northern part of the central plain of Thailand, a system with an irrigated area of about 100.000 ha, mainly paddy.

The approach to performance assessment starts from concepts developed by IIMI (International Irrigation Management Institute). The performance indicators suggested by IIMI are tested by using secondary data from several institutions involved in the development of the irrigation area. Additionally, results from two farm surveys will be used to assess the socio-economic performance of the irrigation system. The surveys are conducted to gain a thorough picture of farming systems in the irrigation system, their household structures and decisions as well as the role of irrigation for on-farm performance. Those results can be related to information from technical analysis of the irrigation system, which is contributed by other partners from the research project, and

thus shed more light on the expressiveness of socio-economic performance indicators in irrigation management.

Figure 8: Communication Potentials



References

BRÜGGER, A. P. (1997): Monitoring & Evaluierung (M&E) als Managementinstrument in der Bewässerung. In: Zeitschrift für Bewässerungswirtschaft (Journal of Applied Irrigation Science) 32. Jahrg., No. 1, pp. 25-41, DLG Verlag, Frankfurt a.M., April 1997.

CASLEY, D. J.; K. KUMAR (1987): Project Monitoring and Evaluation in Agriculture. A World Bank Publication, Washington D. C.

HÖYNCK, S.; RIESER, A. (1996): Unterstützung des Bewässerungsmanagements durch Monitoring & Evaluation. In: Entwicklungsländerbezogene Forschung: Standortgerechte Technologien für den ländlichen Raum, pp. 73-82, Fachhochschule Köln - Institut für Tropentechnologie, Köln.

HÖYNCK, S.; RIESER, A. (1997): Approach to Socio-Economic Performance Assessment in Irrigation Management - A Case Study of Phitsanulok Irrigation System in Thailand. In: Zeitschrift für Bewässerungswirtschaft (Journal of Applied Irrigation Science) 32. Jahrg., No. 1, pp. 5 - 23, DLG Verlag, Frankfurt a.M., April 1997.

LOOMCHAROEN, THAVESILP (1994): Monitoring and Evaluation of Phitsanulok Irrigation Project in Changwat Phitsanulok, Phichit and Nakhon Sawan, M. Sc. Thesis, Kasetsart University, Bangkok.

MERREY, DOUGLAS J.; VALERA, ALFREDO; DASSENAIKE, LALITH (1994): Does Assessing Irrigation Performance Make a Difference? - Results from a Comparative Study of Three Irrigation Systems (Erbringt die Leistungsbewertung der Bewässerung einen Beitrag? - Ergebnisse einer vergleichenden Untersuchung von 3 Bewässerungssystemen). In: Quarterly Journal of International Agriculture, Zeitschrift für ausländische Landwirtschaft, Vol. 33, No.3, S. 276-293, DLG-Verlag, Frankfurt a. M. , July - September 1994.

MURRAY-RUST, D. HAMMOND; SNELLEN, BART (1993): Irrigation System Performance Assessment and Diagnosis, International Irrigation Management Institute (IIMI), International Institute for Land Reclamation and Improvement , International Institute for Hydraulic and Environmental Engineering, Colombo.

RAO, P. S. (1993): Review of Selected Literature on Indicators of Irrigation Performance, IIMI, Colombo.

RIESER, A. (1989): Situative Monitoring and Evaluation (M&E) in Irrigation. In: DVWK Bulletin 16: Situative Specific Management in Irrigation - International Irrigation Symposium Kongreß Wasser Berlin 1989, Verlag Paul Parey, Hamburg, Berlin.

SMALL, L. E.; SVENDSEN, M. (1992): A Framework for Assessing Irrigation Performance. IFPRI: Working Papers on Irrigation Performance 1, Washington D. C.