

# INDICATORS THROUGH BENCHMARKING TO IMPROVE THE OPERATION OF IRRIGATION DISTRICTS IN MEXICO

## INDICATEURS DE BENCHMARKING POUR AMELIORER L'EXPLOITATION DES PERIMETRES IRRIGUES AU MEXIQUE

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### ABSTRACT

*In Mexico, over the past 17 years the operation and maintenance of the hydro-agricultural infrastructure and management of the irrigation modules has been transferred to 476 civil users associations and 13 limited liability companies, formed in the country's irrigation districts. With the management of the users' associations, suitable handling of the modules and agricultural production depends mainly on the adoption of decisions by executives and technicians for modernizing their irrigation systems to achieve greater productivity. The programs implemented by the National Water Commission have endeavored to improve the efficiency and operating conditions of the irrigation districts. The action taken in these programs is intended to strengthen transfer of the irrigation districts to the users, however, an evaluation must be made of the performance of these districts and compare with other districts throu certain bench mark indicators. Evaluation of irrigation module performance calls for strategic indicators which take into consideration the most relevant aspects of irrigation module management, operation, maintenance and conservation, together with the initiatives for modernizing and introducing modern technical procedures for operating the hydro-agricultural infrastructure.*

*Benchmarking for three irrigation districts in the north west of the country has been taken. The information for generating those indicators to measure the performance is obtained during normal handling of the modules. Evaluation of the modules performance considers, firstly, the selection of a group of strategic indicators and the obtaining of information on the agricultural cycle. Methods applied consider the availability of the information; defining variables and strategic indicators and specifying their form of measurement; analyzing and weighing the value of the variables and indicators, and applying a data processing system*

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*to obtain and graphically record the results. The indicators for evaluating irrigation module handling are focused on operation, preservation, modernization and the introduction of modern technical methods, management and transparency. The results of the evaluation are used by the district managers to improve the operation of the areas under irrigation.*

**Key words:** *Bench marking, Irrigation districts, Irrigation modules, Performance indicators, Mexico.*

## RESUME ET CONCLUSIONS

*Au Mexique les périmètres irrigués se distribuent dans tout le pays et ils ont une très grande variabilité aussi bien sur sa grandeur que sur sa productivité. En effet, dans le nord du pays la propriété moyenne a 10 hectares par usager alors que dans le sud elle en est de deux hectares. En plus de cette hétérogénéité, pendant les derniers 20 ans il y a eu des changements dans la gestion des périmètres irrigués, car sa gestion a été privatisée, c'est à dire que le gouvernement a donné en concession l'infrastructure hidoagricole et laissé la gestion de l'eau aux mains des associations d'usagers. Actuellement ce sont 576 associations d'irrigants les responsables de proportionner le service d'irrigation aux usagers. En général ces changements ont été positifs, car les investissements privés ce sont accru et la maintenance, l'operation aussi bien que l'administration des périmètres irrigués se sont amélioré par rapport au temps ou c'était le gouvernement le gestionnaire.*

*En vue d'évaluer le comportement des périmètres irrigués, plusieurs outils ont été mise en place, tels que Rapid Appraisal, Report Card, SINHDR et Benchmarking, parmi d'autres. De cette ensemble de méthodes le Benchmarking est le plus répondu, car il s'agit d'une méthode adaptée et testée dans les conditions des périmètres irrigués mexicains. La méthode du benchmarking c'est un processus systematique d'amélioration continue laquelle se basse sur l'application des normes et standard de performance possibles d'atteindre et rélevants. Les résultats de la application du benchmarking dans 16 modules d'irrigation du périmètre du Rio Mayo dans l'état de Sonora au nord du pays, montrent que la technification dans la parcelle et la reconversion productive permettent une meilleure performance des modules. Mais malgré ca, et en vue de diminuer les couts de gestion dans les 16 modules, il est recommandé le compatage des modules et laisser seulement huit.*

**Mots clés:** *Benchmarking, périmètres irrigués, modules d'irrigation, indicateurs de performance, Mexique.*

*(Traduction française telle que fournie par les auteurs)*

## 1. INTRODUCTION

In Mexico, irrigation districts are located along the country, with land and production systems that have a great variability amongst them. Besides these differences, a series of changes have occurred in the last years due the transfer of infrastructure and water concession to the users. This has brought in positive changes on the investments of the private sector to the districts and achieving a better coordination between users and district managers with

the institutions of the hydro-agricultural sector. The users' interaction with the government institutions has increased, with the consequent increase of independency to administrate, operate, maintain and preserve the irrigation districts.

With the purpose to evaluate the current districts behavior, different evaluation systems have been put into action, such as RAP, benchmarking, Report Card, SINHDR and others. Amongst these, the benchmarking stands out. Benchmarking is a systematic process that assures continuous improvement through comparison of internal or external rules and standards that are reachable and relevant. Its main objective is to use the performance of an organization as a measure against its mission and objectives (Fig. 1).

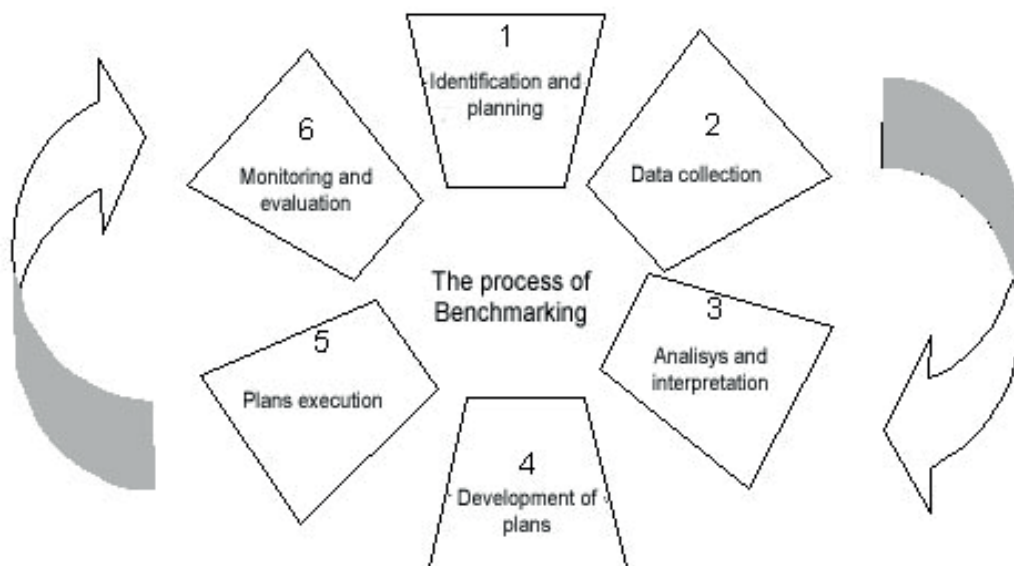


Fig. 1. Benchmarking process

## 2. EVALUATION OF IRRIGATION DISTRICT 038, RIO MAYO, SONORA, MEXICO

### 2.1 Objectives

The main objective of this work is to evaluate the irrigation district through the indicators behavior in a five year period (1999-2003) and obtain the indicators tendency to set a hierarchy in the irrigation modules and compare them. Benchmarking was applied to irrigation district 038, Rio Mayo, in Sonora. As goals, policies have to be established to improve the irrigation district performance and work out a permanent scheme of evaluation.

The management of this district is in charge of a limited responsibility society to operate the main network and of 16 users associations grouped in irrigation modules. The district was established in 1955 and transferred to the users' associations in 1992. They have 96,871 hectares for irrigation, which is distributed amongst 12,019 users. It is located south of the

state of Sonora, in the II hydrologic region. The water source is the “Adolfo Ruiz Cortínez” storage dam and Tesias’ diversion dam. The most important crops are: wheat, safflower, potato, corn, chic-pea, bean, alfalfa, baby tomato, early vegetables and tomato.

## 2.2 Methodology

For the application of benchmarking, the variables of interest were prioritized and selected to cover different aspects. Information was gathered on the general condition of the hydro-agricultural infrastructure and the current needs of investment. Specific information of the irrigation modules was collected such as the number of users, land classification, rented and sold lands, seeded land, production, volume of water used, average yield and value and cost of production. Specific information was also gathered of lands that have high and low pressure irrigation system, the area affected by salts or waterlogging and the investment needs in new irrigation systems and land reclamation. Information related to the water operation and administration by the users, such as income and expenses in administrative areas, operation, conservation and maintenance, cost of receiving water and its delivery to the users, the desirable water cost to achieve financial self-sufficiency, Information storage and retrieval mechanisms and results of the studies carried out in the modules. The benchmarking results were classified in four main indicator groups: Water and land productivity and production, the system operation, contribution to income and expenses distribution.

## 3. RESULTS

Amongst the main results obtained from the analysis in the last five years, we observed increments in the gross water productivity (expressed as \$/M3) in 11 of the 16 irrigation modules upon transferring the hydro-agricultural infrastructure to the users’ organizations (Figure 2).

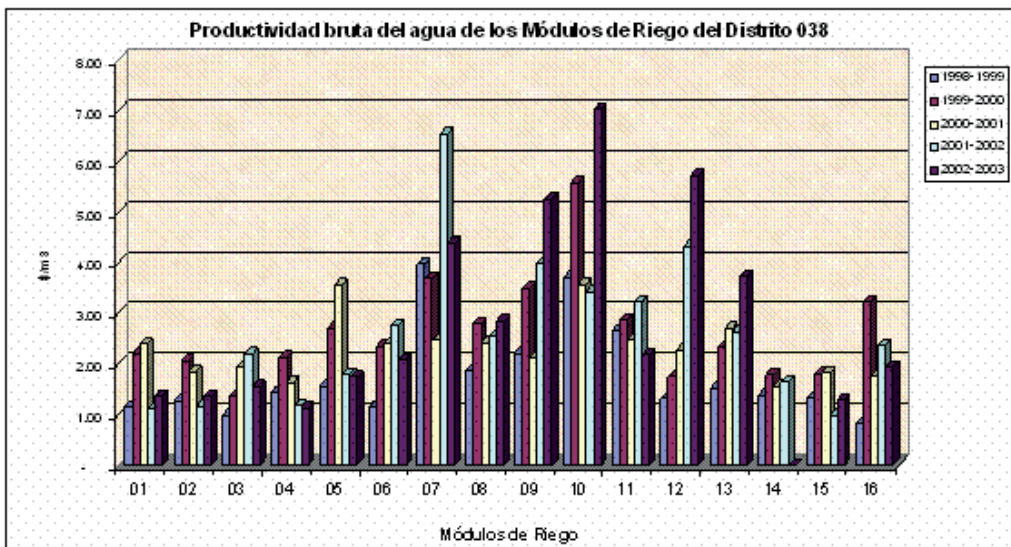


Fig. 2. Water productivity in the Irrigation Modules.

Figure 2 shows that the users' groups can be classified into four levels: a group of "Excellent productive behavior" comprising modules 7,9 and 10; a second group comprising modules 5,6,8,11,12,13 and 16 who show significant increase in land productivity and production; a third group comprising irrigation modules 3 and 14 with fluctuating production and productivity; and the fourth group comprising modules 1, 2 and 4 where there was no significant changes in their behavior related to measures and do not have any increase in their productivity, implying an economic status-quo.

The analysis of the gross productivity of land during the last five years (Figure 3) shows the behaviour of different irrigation modules in terms of their productivity and tendency.

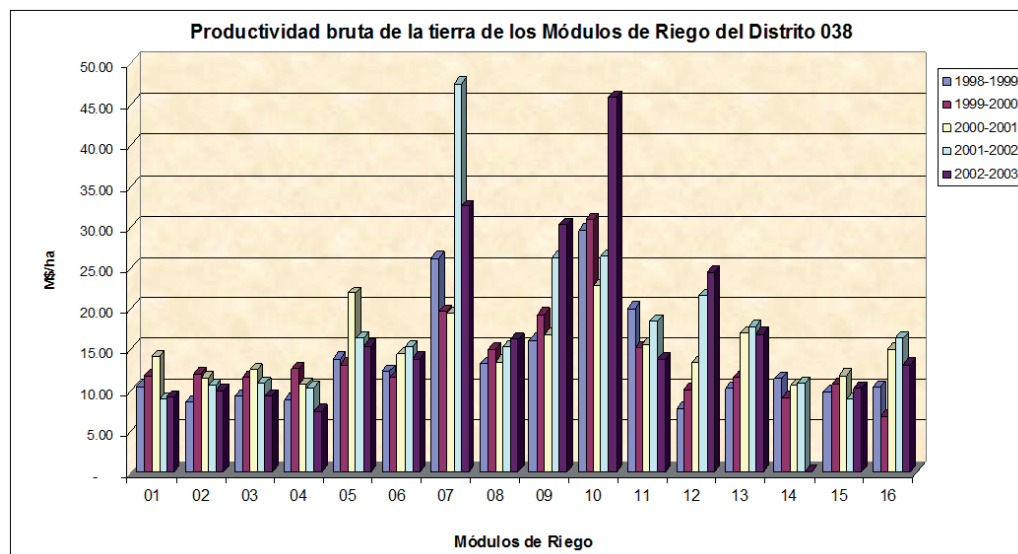


Fig. 3. Land productivity in irrigation modules.

In the first place we have the Leading Group (Group 1) in land productivity comprising those who have the highest productivity rates and oscillate between 20,000 and 45,000 pesos per hour. The irrigation module 9 that represents an increasing productivity during this period, is considered the best module. Followed in hierarchy by irrigation module 10 with productivity values lower than that of 9 but with a constantly increasing tendency. The third was irrigation module 7 due to its high value of land productivity, which, however has fluctuated, especially in the last year when it showed a significant decrease.

Group number 2 comprises three irrigation modules and its gross productivity on land oscillates between 15,000 and 20,000 \$/ha. In first place in this group we find module 12 that represents a clear tendency to increase its productivity. This is followed by irrigation module 5 where the productivity values do not have a constant trend and is similar to module 11 that presents the lowest productivity values in this group.

Group 3 comprises modules 13, 6, 8 and 16 that have an oscillating productivity between 10,000 and 15,000 \$/ha, however, the first two modules present an increase in their

productivity which is catalogued as constant, while the third module shows ups and downs in its trend. These irrigation modules require improvement in their technology levels for increasing the productivity.

Group 4 comprises irrigation modules that show a gross productivity of land with the higher values. Within this group, modules 15 and 14 present the highest values, however, their trend is fluctuating with time. In this group, the modules 1, 2, 3 and 4 show the lowest productivity as a group.

An important aspect in resources administration is how the operating, conservation and administrative expenses are distributed. From the results, and considering the average of all the irrigation modules, we observe that the most significant tendency is to divert more economic resources for administrative and operational expenses (expenses with 24% and 55% instead of 15% and 35% respectively), decreasing significantly the conservation and maintenance expenses where only a 21% of the expenses are applied, instead of a 50% average needed (Figure 4).

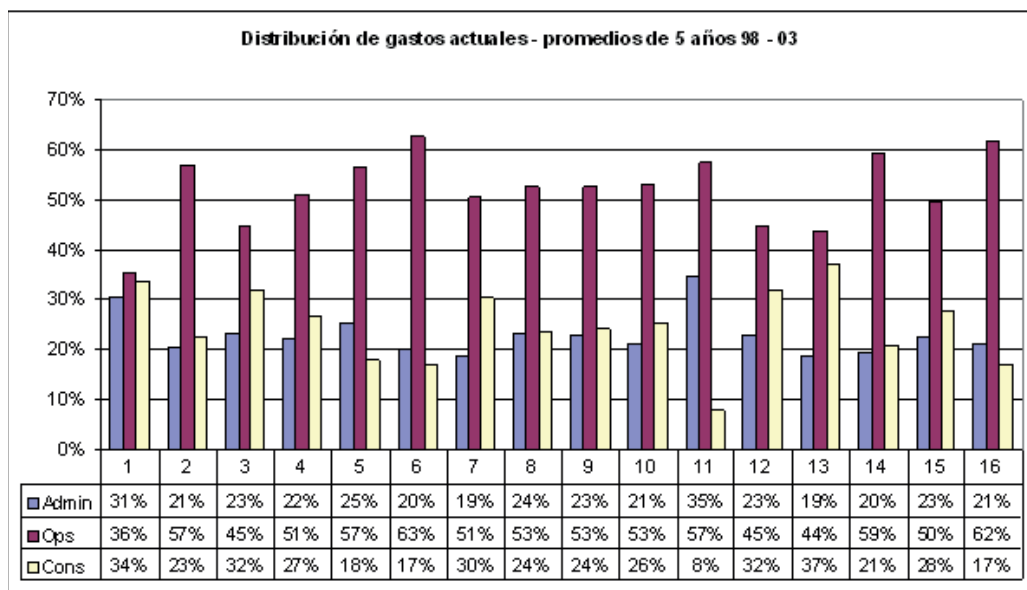


Fig. 4. Distribution of administrative, conservation and operation expenses.

Regarding the system operation, in general terms, its flexibility is considered adequate. The quality in water readings, which is catalogued as regular in function of the available structures and a lower network level and outlet in farms, was rated as insufficient. Trust in delivery is adequate although sometimes it is behind schedule, due mainly to the lack of control and reading structure in the minor network and farm water outlet. Finally, the equity in module distribution control point is adequate, but internally qualified as inequitable.

## 4. CONCLUSIONS

Benchmarking application allows drawing the following conclusions:

- a) The leading group (modules 7, 9 and 10) must be considered as examples to be followed by others and the information of its measure are to be disseminated.
- b) Significant administrative and operational cost reduction is needed to avoid rehabilitation problems in the irrigation districts.
- c) Modules 8 and 16 need improvement, preferably by unifying the leading modules to the modules with measurement problems and
- d) Integration of a water bank is needed to allow the exchange of the resource, where its sale price is standardized in terms of its availability and to achieve income that must be specifically canalized to preserve the irrigation district.