

# RESULTS OF IRRIGATION MANAGEMENT TRANSFER IN COELLO AND SALDAÑA IRRIGATION DISTRICTS, COLOMBIA<sup>1</sup>

by

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## INTRODUCTION

### Management Transfer

Since the 1980's many countries around the world have embarked on programs to transfer management for irrigation systems from government agencies to water users associations. Generally, the policy reflects the need to reduce government expenditures for recurring costs of irrigation management by line agencies (Vermillion, 1992). Transfer policies also reflect a recognition that government agencies have not been very effective in managing irrigation systems according to farmer demands (Repetto, 1986). Transfer proponents generally assume that farmers are capable of taking over management and have greater incentive than government agencies to improve cost efficiency and keep their systems financially and physically sustainable.

Management transfer may involve outright privatization of ownership of irrigation structures (Farley, 1994; Gazmuri, 1994) or it may only involve mobilization of farmer resources to manage systems (Wijayarathna & Vermillion, 1994). Where farmers are already paying for the cost of irrigation services there is some evidence that farmers are more willing to take over management from the government (Svendsen & Vermillion, 1994; Vermillion & Garces, 1994). But in many cases, especially in developing countries, governments have failed to collect irrigation fees and are forced to transfer management for financial reasons. In these cases, management transfer comes at the initiative of the government and means an increase in the cost of irrigation to farmers (Vermillion, 1991). Somewhat problematical, transfer policies have been occurring during a time when world grain prices have been on the decline.

In Latin America, privatization has generally been imposed by governments rather than the private sector (Glade, 1991). However in 1975 in Colombia, prior to the wave of privatization in the 1980's, farmers in the Coello and Saldaña irrigation districts exerted pressure on the government to take over management of the irrigation systems (Plusquellec, 1989). In contrast to many situations, farmers in these systems had already repaid 90 percent of system construction

costs and were also paying for routine operation and maintenance. They petitioned the government to take over management on the grounds that they had the right to own the systems because, after 20 years, they had repaid their required cost of construction. Farmer leaders asserted that they could manage the systems more efficiently by themselves and could keep the costs down in the future.

This study<sup>3</sup> describes the transfer process in Coello and Saldaña and examines its effects on management performance. Key questions addressed are:

- 1) Did the transfer achieve viable local management? and
- 2) How did management transfer effect the performance of the irrigation system, especially for cost-efficiency and financial sustainability?

This case was selected in part to examine the conditions which motivated farmers to take over management. It also provides an interesting contrast to situations common in Asia where the legal status of farmer organizations is weak and where considerable emphasis is placed on motivating, organizing and training farmers to take over irrigation management (Korten and Siy, 1988). In Colombia, the transfer was primarily a process of negotiating the terms of transfer and making changes in the users association, management staff and the accountability of staff to the association.

### **Irrigated Agriculture in Colombia**

Colombia is located in the northwest corner of South America at a latitude of 5° North. It is a mountainous country with an area of 1.1 million sq km and a population of 31.8 million people. The country has relatively abundant water resources including more than 1,000 perennial rivers. It has both tropical and temperate climates and an average rainfall of 1,500 mm/year. A marked bi-modal distribution in April/May and October/November makes the need for irrigation primarily supplemental (Garces & Vermillion, 1994).<sup>4</sup>

Of 6.6 million ha of potentially irrigable land in Colombia, only 11.4 percent or 750,473 ha has already been developed, consisting of 525,869 ha under irrigation and 224,604 ha under drainage and/or flood protection facilities (Sandoval, 1990).

At present, 155,454 ha of land are irrigated by the public sector, under the supervision of HIMAT<sup>5</sup>, and 370,415 ha are under private sector or farmer management. The private sector has played a major role in the development of irrigated agriculture in the country, representing 70% of the present total irrigated area (Garces, 1992).

Irrigated agriculture in Colombia includes a wide range of technologies. Under private sector enterprises all types of pressurized irrigation are available: self-propelled devices, sprinklers, micro-jets, buried pipes, etc. Most public irrigation systems are gravity-flow schemes although there are some pressurized pump systems. Under gravity irrigation, it is common to see siphons, furrows and basin irrigation.

The Government of Colombia is currently engaged in an ambitious irrigation subsector development strategy. The government plan has three main and inter-related components: i) a ten-year irrigation expansion program with roughly 500,000 ha as the target; ii) a "mini-districts" program which develops new, small-scale irrigation systems primarily in hilly areas, and iii) an irrigation management transfer program that will eventually turn over management of the 23 large-scale irrigation districts to farmer water users associations (Republica of Colombia, 1991).

## **IRRIGATED AGRICULTURE IN TOLIMA VALLEY**

### **Physical Context**

Coello and Saldaña irrigation districts are located in the Tolima valley in the central part of Colombia (Figure 1). The valley is at an elevation of 380 meters and is surrounded by the Andes mountains. The valley sits between the central and west mountain ranges of the country with the large Magdalena river running through the middle, creating the Magdalena and Tolima valleys.

The Tolima valley has a mostly flat topography with undulating terrain towards both mountain ranges. The valley has primarily alluvial soils, fans, terraces and narrow valleys with minor rivers. Soil erosion is evident as one moves up the hillsides but is not yet a problem in the valley floor. Main soil orders are entisols, inceptisols and vertisols (IGAC, 1987).

Yearly precipitation in the valley is between 1000 and 1500 mm. The median temperature is 27.9°C. Average relative humidity is 74% and the yearly average tank evaporation is 1800 mm.

## Agricultural and Socio-economic Context

Agricultural practices in the area can be traced to pre-colonial times when the land was in the hands of the Indian Chief Saldaña. After the Spanish conquest the lands were turned over, by Royal Decree, to Carmelitas Missionaries who tilled the land with the help of the local population. After the establishment of the Republic in 1820 the lands were purchased by a few large landowners who allowed local peasants to work the land in exchange for one-third of the produce and six weeks of free labor in the main "haciendas". Land near rivers was cultivated, with maize, plantain, cassava, and rice being the main crops. (IICA, 1965).

Increasing social pressures and discontent with exclusive land tenure patterns led to the break up of the original "haciendas" or large farms cultivated by peasants. In the early 1930's, the Government of Colombia reformed the land tenure system and divided up large farms and sold plots of between one and 10 ha in size to former land renters and laborers (IICA, 1965).

In 1943, after many years of feasibility studies and growing social unrest, the then Ministry of Economics undertook a final study (McCausland, 1945) which led to the construction of the Coello-Saldaña Irrigation District under the direction of Caja Agraria, a semi-independent lending and development agency. The report recommended an irrigation district needing 13 m<sup>3</sup>/s from the Coello River to serve 20,000 ha. It would include about 2,500 owner cultivators with an average farm size of 6.6 ha. The cost of the project was estimated at 5.7 million pesos in 1943, which included capital cost, purchase of land, interest, construction and contingencies which amounted to Ps 287 per ha (McCausland, 1945).

The introduction of irrigation to the area transformed the agriculture of the valley. Cotton became an important crop during the early period of the irrigation district in the 1950's and 1960's. It was eventually replaced by rice which became the main irrigated crop by the 1970's and remains so today. Maize, sorghum, fruit and vegetables are also now irrigated in the valley.

Remaining haciendas changed to agricultural enterprises and became production oriented. With the enhancement of work opportunities and, hence, better social well-being of small holders or landless farmers, relationships between large and small land owners improved. Training programs on farm management, credit, developing cooperatives, and so on allowed small growers to increase their incomes (I&H Ltda, 1985). Today, Tolima valley is an important farming area and is a relatively prosperous part of the country. Given its central location and major roads which pass through Tolima, it has a comparative advantage in food distribution. This has resulted in the development of

numerous towns where agriculture and agro-business constitute the mainstream of the local economy. These include farm machinery and spare parts dealers and repair shops, hardware and agricultural inputs stores and spraying companies. The Caja Agraria and Banco Ganadero (a private credit and development bank) are important agricultural credit institutions which have been available to small and large holders in the valley for more than 20 years.

Also present in the area are a large number of both public and private organizations which provide technical assistance and/or agricultural support services to farmer managed irrigation systems.<sup>6</sup>

## **DEVELOPMENT OF COELLO AND SALDAÑA DISTRICTS**

Construction began in 1945 and was completed by 1953, when the district became operational. Coello and Saldaña Districts were initially constructed and managed as a single district. They were separated in 1976 when the management was transferred from the government agency to the water users associations.

Coello Irrigation District is a river diversion system by means of a lateral intake with a design capacity of 28 cubic meters per second ( $\text{m}^3/\text{s}$ ). The intake consists of an approach channel formed by an earthen levee, which facilitates flow intake during low river levels in the dry season. The intake has two radial gates with provision for both sediment intake and water depth control (HIMAT, 1991a). The intake channel leads to the main conveyance canal (Gualanday) which has a capacity of 25  $\text{m}^3/\text{s}$  and extends for 5.7 km before reaching the command area. The main canal divides into four branch canals at this point: Serrezuela, Jaramillo, Tolima and Espinal. Each branch canal leads to secondary and tertiary canals, all of which are unlined.

The district covers an irrigated area of approximately 25,600 ha, making it one of the largest schemes in the country. The district was not designed with a parallel drainage system, which has resulted in waterlogging and salinity problems on as much as 7,000 ha. It has 1,347 water users with 1,826 holdings. Average farm size is 14 ha. (See Table 1 for additional basic data.) 26.6% of farms are five ha. or less in size; 14.4% exceed 50 ha in size (Table 2).

The Saldaña Irrigation System is also a river diversion scheme, south of Coello District, diverting water from the Saldaña River. Saldaña has a direct intake without an approach levee. The intake structure also has radial gates and water head controls. It has a design capacity of 30  $\text{m}^3/\text{s}$  which leads to the main conveyance canal (Canal Ospina Perez). This canal runs parallel to the Saldaña River for 13 km and has three off-take branch channels: Animas, Norte and Sur.

In turn, each branch leads to sub-systems of secondary and tertiary canals, all unlined (HIMAT, 1991b).

Saldaña district covers an irrigated area of approximately 14,000 ha. The lack of a complementary drainage system has resulted in waterlogging of up to 1600 ha in the Rio Chene area. With 1,500 water users having 1,850 holdings the average farm size is 7.5 ha. (Table 1) 56.4% of the farms in Saldaña are five ha. or less in size; only 5.1% exceed 50 ha. in size (Table 2).

Prior to the transfer, and under the administrations of the districts by Caja Agraria from 1953 to 1968 and Incora (the government land reform agency) from 1968 to 1976, selected rehabilitation took place in both the Coello and Saldaña. In Coello between 1968 and 1973 more than 2,895.67 million pesos (Ps), in 1988 constant pesos, were invested in rehabilitation. In Saldaña, between 1969 and 1972 more than Ps. 760 million were spent on irrigation and drainage works (Table 3). Due to recent rehabilitations, by 1976, at the time of the transfer, rehabilitation was not an important issue in negotiations between HIMAT and the farmers about the terms of management transfer and hence, no rehabilitation was done in either system in connection with the transfer.

However, the issue of financing rehabilitation was always a matter of concern for both the government and the emerging user-managed districts. Who should pay for rehabilitation works after the systems were turned over to the users associations has been an issue which has yet to be settled and which has increased in concern now that the transfer process is being extended by the government to all irrigation districts in the country. In the case of Coello and Saldaña, the users argued that since the government had not turned over the infrastructure and had instead "delegated" the system, it was the responsibility of the government to maintain the works which belonged to the nation. This argument, however, ran counter to their earlier argument that since they had already paid for the construction of the system they should own it. Despite pressure from the government farmers refused to pay or repay any of the cost of rehabilitation in either system.

## **MANAGEMENT TRANSFER IN THE TWO DISTRICTS**

### **Transfer Process and Agreement**

In the early 1960's the Government of Colombia entrusted the operation and maintenance of its irrigation districts to INCORA, a government land-reform agency. The performance of the agency in irrigation management was modest at best. Water users of the Coello-Saldaña District were not only unhappy with the poor O&M service provided but were also concerned about the high

management costs. In the early stages of development in the 1950's more than 90% of the farmers paid the water fee, but this percentage declined over time due to farmers' dissatisfaction with the quality of management. Declining fee collections further hindered the ability of the agency to provide effective irrigation service. Inefficient operation and maintenance of the system further motivated farmers to request management be transferred to them.

As a result the farmers, who had already formed a water users association, decided at their own initiative in 1975 to make a formal request to the government that management responsibility for the system be transferred to the association of water users. The association argued that the scheme was legally their property on the basis that they had already paid the government their due share for the costs of construction.

As part of a policy to improve the performance of the irrigation districts, in 1976 the government created HIMAT which had an initial task to turn over the management of the Coello-Saldaña District to two newly-separated water users associations, thus establishing two separate districts, Coello and Saldaña. This was the first case of irrigation management transfer in Colombia. It set a precedent for other transfers later on.

Negotiations for management transfer were completed within a year, between 1975 and 1976. The associations hired their own lawyer to represent them in negotiating the terms of the transfer. Issues to be resolved were the disposition of existing district staff, ownership status of scheme assets and the future degree of control or involvement of HIMAT in the districts. It was finally agreed that most of the existing staff would be retained by the districts and others would be transferred out. Ownership of assets would remain with the government. HIMAT would retain a role of oversight for district management, to ensure that the systems were properly maintained.

The transfer process employed a legal rule in the country's constitution referred to as "Delegation of Administration," by which a public good (in this case, an irrigation district) could be turned over to a private-sector corporate entity (a water users association) for administration on behalf of the state. The users were then empowered to recruit staff and organize and manage operation and maintenance of the two systems with the proviso that it would be financially self-reliant and government subsidies for O&M would be discontinued.

Since responsibility for the districts was only "delegated," ownership of assets remained with the government. The government argued that under existing laws it could not relinquish ownership of scheme assets. The delegation of administration created a continuing labor relations conflict between the districts and the government which resulted in numerous legal debates and

proceedings until the 1990's. Labor laws prohibited the firing of existing staff previously hired by the government. This problem became widespread when the government started transferring management to farmer districts throughout the country in 1990. Eventually in 1993 a new land development law was enacted with the intent to grant full control to the districts to hire and fire personnel as they wish (Min. of Ag, 1993).

## **Changes in Management**

Before transfer, irrigation was scheduled on the basis of pre-season crop plans and water requests which were submitted by duly registered farmers. Farmers had to pay the area-based water fee prior to the season for which water was ordered. District management prepared the irrigation schedule based on the irrigation orders received. Irrigation requests were approved to the extent that predicted water availability met the aggregate demand. The user was responsible to go to the district office before the season to sign an agreement with the seasonal irrigation plan. The user was informed of the day and time of his or her irrigations and the ditch tender made an inspection of the farm to make sure that the canals, turnout and measuring devise (if any) were in working condition. The ditch tender was responsible for delivering water to farm turnouts according to the agreed schedule and for recording the total water delivered for the season. The volumetric fee was paid after the season and had to be paid before any irrigation orders could be approved for the next cropping period.

Prior to transfer the agency was responsible for preparing annual plans for maintenance and repairs. Such plans were prepared by the head of the maintenance unit based on field inspection and occasionally from users feedback or complaints. The most common maintenance works were desilting and cleaning of canals, road maintenance and structural repairs. Targets were established in advance but deviations were common due to funding constraints for repair or operation of heavy equipment.

District management had administrative and operational manuals detailing roles and responsibilities of staff and users. These included guides for applying sanctions for non-compliance with rules. Data on daily rainfall, temperature and relative humidity are available since project inception to the present. Data on river, main and branch canal flows were also recorded daily but are no longer available for certain years. Records of seasonal crop and irrigation plans, fee collection levels, register of farmers, inventory of equipment and supplies, accounting, and yearly budgets were kept regularly. However, information management and record-keeping reportedly declined by the mid 1970's (Incora, 1974).



After transfer HIMAT retained a partial supervisory role for O&M plans, irrigation scheduling, fee collection and budgeting. It provided technical guidance to the new district boards and management. Also, under the transfer agreement most former agency employees remained with the districts. Hence, there was little change in routine operational rules and procedures, at least in the first few years after transfer.

Gradually, after transfer, the new district administrations started introducing innovations and trying to become more efficient. Attention was given to reducing staff where possible and revising cropping patterns. In Coello, where water supplies were insufficient for planting rice over the entire system, a rice rotation and zoning plan was introduced to enable all farmers to plant rice at least once per year. In Saldaña a continuous, staggered rice planting arrangement was introduced which allowed 2,000 ha of rice to be planted every month. This improved the water distribution and reportedly improved farmers' profit margins somewhat by spreading rice marketing throughout the year.

After the transfer in 1976, the users associations for Coello and Saldaña Districts elected boards of directors to supervise their respective districts. Each board had, and still has, seven members with fixed quotas for two categories of farmers--four members having farm sizes less than 20 ha and three with farm sizes of more than 20 ha. After transfer each board recruited general managers who were engineers. The districts then became responsible for day-to-day operation and maintenance of the systems. This included setting and collecting water fees, hiring and firing their own personnel and planning yearly budgets. In practice though, HIMAT retained considerable influence over the management of the districts. This included providing advice and consent over O&M budgets and work plans, water fee levels and staff disposition. The agency also retained direct management of the diversion weirs and main conveyance canals for both systems.

One of the more noticeable results of the transfer was the significant reduction of personnel. Before transfer, in 1975, the two districts combined had a total of 300 employees. As can be seen in Table 4, the total staff for both districts was 189 by 1993, which was a 37% reduction since transfer. Accounting for changes in area irrigated, in 1975 there were 62.3 ha of service area per district staff. By 1993 this had risen to 147 ha per staff. The number of administrative staff remained the same, at 36. Most reductions were made in maintenance and technical support staff. Staff reductions were gradual and occurred mostly through attrition and non-replacements after retirements. This was because of a law making it difficult for managers to fire government employees.

The reduction in personnel allowed management to streamline the organizational structure by combining sections and integrating functions. The general manager, who is responsible to the association Board, supervises an administrative unit and three technical units--operations, maintenance and technical services. The Technical Unit was initially merged with Operations after transfer, but was later restored as an independent unit responsible for water measurement, estimation of water supplies and a meteorological station. The operations unit is further divided according to zones and sub-sections of the system (Chart 1). District board members and agency officials agree that paper work has diminished and administration has become more efficient after transfer, mostly for irrigation scheduling, fee processing and for communications between users and district management.

### **Organizational Viability of the Districts**

Farmers in both districts elect a board of directors of seven members and vote on them every two years in a general assembly. In Saldaña about 446 farmers (roughly 20%) participated in the meeting on July 13, 1976 in which the vote was taken for accepting the transfer agreement. Thereafter farmer participation in general assemblies held every two years was roughly 12 to 16% of the membership, varying between 201 and 295 farmers attending and voting in the meetings through 1992 (Table 5). There is no downward trend in participation. It is apparent from interviews with farmers that more disputes and tensions between farmers exist in Saldaña than in Coello. Because of the larger number of small farmers in Saldaña, there is an average of only seven ha per farmer, compared with 14 ha per farmer in Coello. This apparently complicates organizational sustainability in Saldaña, as was reflected in interviews with farmers.

The board recruits and selects the general manager and participates with the general manager in the selection and firing of other district staff. Since all district staff are accountable to the board, some improvement in accountability to farmers' interests has been reported by farmers and district managers interviewed. However, some farmers interviewed reported that field operations staff are still sometimes improperly influenced in the distribution of water by influential farmers and board members.

The policy of partial farmer repayment of construction costs and enforced payment of seasonal water fees engendered in the farmers enough of a sense of ownership in their systems that they lobbied the government to take over management and obtain real ownership of system assets. The fact that most

farmers were paying water fees to cover the main share of O&M costs prior to turnover created a more motivating condition for the farmers to take over management. This is because of the expectation that they could not only improve management but could also contain or perhaps reduce the cost of irrigation.

The half-way response of the government of "delegation of authority" only partially satisfied the farmers' interest in obtaining full local control for system management. In practice it became apparent to farmers that more *responsibility* than *authority* was transferred to the districts. Although farmers had wanted HIMAT to play more of an advisory role, the government retained more of a supervisory role over district budgets and O&M plans. After transfer the districts were unable to cut staff and costs as much as they wanted. However, it is apparent that many farmers want the agency to continue to provide technical and financial support services. Several farmers interviewed stated the need for HIMAT to act as an auditor and mediator to help legitimize the farmer organization and settle disputes.

The failure to transfer ownership of system assets to the associations, combined with an expectation that the government would make future repairs and replacements, left farmers without a reason to raise a capital replacement fund. Such a fund probably would have considerably strengthened the organizational and financial sustainability of farmer associations.

## **Perspectives About the Transfer**

The initiative for transfer came from the water users rather than the government. Farmers assessed the implications of transfer and gave their collective approval in general assembly meetings. By the time of transfer farmers were already financing most of the cost of O&M and had the expectation that they would be able to keep the irrigation fees from rising or even reduce them.

Farmers interviewed for this study had the following main positive perceptions about the transfer:

- 1) it helped keep irrigation costs down,
- 2) it improved accountability of staff to the farmers,
- 3) it improved the timeliness and responsiveness of management decisions and
- 4) it led to a decrease in political appointments for staff positions.

Interviews with board members in both Coello and Saldaña showed they placed high priority on cost reduction. Interviews with farmers also revealed the widespread perception that water distribution performance, structural maintenance and cost efficiency could have been much more improved had the users had full control over staff disposition and budgets prior to the 1993 Land Development Law.

Some farmers expressed the view that by taking over the administration of the systems they were providing a service to the nation by diminishing social unrest related to water problems and that therefore the government had some obligation to compensate the association for that service.

District managers expressed concern that the strong farmer disposition toward cost reduction was resulting in some decline in service. Senior experienced personnel have been replaced by younger, inexperienced staff; key technical positions have been eliminated or merged and little or no expenditure is being made in training or replacement of equipment or structures.

HIMAT staff at the district and higher levels were generally resistant to the transfer at first. They had the perception that jobs would be lost and the role of the agency would diminish in irrigation management, not only in Coello and Saldaña but eventually elsewhere as well. However, negotiations and some political contacts made by farmers eventually resulted in the transfer decision.

Later it became apparent to farmers that HIMAT's role in the districts was more than just "oversight." Many farmers saw it as restricting their ability to further reduce staff and budgets, as the associations had wanted. Farmers perceived the transfer as being only partial and not enough to give them full control. However, 15 of 18 farmers interviewed in Coello stated that HIMAT (now "INAT") should continue to be involved in assisting the districts, especially in subsidizing the cost of irrigation, providing technical guidance and conducting financial audits and oversight. Sample farmers in Saldaña tended to see HIMAT as more the problem than the solution. Nineteen of the 25 farmers in the Saldaña sample stated that HIMAT should withdraw completely from involvement with the district; only four suggested HIMAT should continue its involvement.

Of 20 sample farmers in Coello, 16 said that management transfer had not changed the overall management performance of the districts, four said it had improved and none said it had worsened. In Saldaña the picture was less

positive. Eleven of 25 sample farmers said management performance had worsened after the transfer, nine said it had not changed and five said it had improved. However, it is a widespread view among users that while problems remain, bureaucracy and corruption have diminished.

## **EFFECTS OF MANAGEMENT TRANSFER ON PERFORMANCE**

The government's interest in the transfer was initially to accede to political pressures and later to reduce government subsidies to the irrigation sector through a national policy of management transfer. In Coello and Saldaña the government was successful in discontinuing its subsidies for O&M, however it continues to fully finance rehabilitation. If farmers feel they can defer maintenance costs so that the government will finance future rehabilitations, the government may not conserve as much money in the irrigation sector as it would like.

As stated by farmers and association board members, their performance objectives of the transfer have been to be as cost efficient as possible while not sacrificing the agricultural productivity, irrigation performance, financial viability and physical sustainability of the districts. We assess performance of the districts according to these criteria below.

### **Agricultural Productivity**

The gradual expansion of irrigated area after construction halted for about four years at the time of transfer, perhaps because of uncertainties and inefficiencies temporarily created by the change in management. But the expansion resumed after this apparent learning period and only began levelling off in the early 1990's (Figure 2). The rate of expansion has been higher in Coello than Saldaña.

Largely as a result of the introduction of green revolution varieties in the 1960's and 1970's, average rice yields increased dramatically from approximately 2,500 kgs in the mid 1950's to approximately 6,000 kgs in 1976, at the time of transfer. By the 1990's average rice yields were between 6,500 and 7,000 kgs per ha. Most of the increase in yields occurred before transfer, but high yield levels were sustained after turnover through the early 1990's, with a slightly increasing trend (Figure 3).

## Irrigation Management

There is no indication that the operation or maintenance of the system improved or deteriorated dramatically as a result of the transfer. Water continues to be delivered without being measured below main canal offtakes. Comparison of data from 1982 to 1993 on the annual volume of water diverted at the headworks with the aggregate amount of water delivered to all tertiary canals, provides a measure of what is termed herein as "total conveyance efficiency" (Figure 4). Annual measures of total conveyance efficiency for this period ranged between 32% and 78% in Saldaña and between 60% and 78% in Coello.<sup>7</sup> The average was 60% in Saldaña and 69% in Coello.

A field check was made on July 15, 1993 comparing actual and target discharges into farm outlets along a tertiary canal located at the Florencia Secondary Canal in Saldaña District. The ratio between actual and target discharges is termed the Delivery Performance Ratio, or DPR. From the first outlet at the headend to the 18th outlet at the tail, the DPR exhibited a clear downward trend from head to tail, ranging from 260% at the head to 75% at the tail (Figure 5). One such test can not verify a pattern but it does suggest a distribution problem may exist in Saldaña. Unfortunately, the lack of measurement devices and limited resources for this study did not permit further measurement of irrigation performance.

Farmers interviewed in both districts were equally divided between those who feel the amount of water delivered to their fields is in accordance with what they were supposed to receive. Several smallholder farmers interviewed noted that some influential larger farmers, including association board members, tend to intervene in day-to-day management and give orders directly to ditch riders or other field staff, sometimes for partisan purposes. In Coello 25% of sample farmers said they were aware of unfair or unofficially excessive water deliveries occurring, while in Saldaña half of sample farmers reported unfair or unofficial water deliveries. Farmers in both districts identified the primary beneficiaries of maldistribution of water as large landowners, not headenders.

Sample farmers in both districts were asked what were the three most important constraints to higher yields and higher profits on their farms. Of 112 total responses only 14% identified water supply or drainage problems as key constraints to higher yields (as opposed to other problems such as inputs, soils, pests, etc.). The most commonly-mentioned constraints to profits were low crop prices and high costs of fertilizer and pesticides. Only 25% of the responses identified the high cost of water as a key constraint to higher profits.

## Financial Viability

After transfer, the farmers' irrigation policy was essentially to improve cost efficiency while achieving a more responsive irrigation service. This was only partially successful.

The Coello and Saldaña districts have both a fixed area-based water fee and a volumetric water fee. The emphasis by farmers after transfer on cost efficiency resulted in a decline in the area fee since transfer. However the volumetric water fee rose after transfer in real terms (1988 pesos). In Coello the area fee has dropped from about Ps 3,000 per ha in 1976 (at transfer) to Ps 1,850 per ha in 1993 (in 1988 pesos; see Figure 6), while the volumetric fee rose from about Ps 0.42 per cubic meters (m<sup>3</sup>) in 1976 to Ps 0.54 per m<sup>3</sup> in 1992 (in constant 1988 pesos; see Figure 7). In Saldaña both area and volumetric fees are higher than in Coello. In Saldaña the area-based fee dropped only slightly after transfer, from Ps 3,000 per ha at transfer to Ps 2,650 per ha in 1993. The volumetric fee rose from Ps 0.42 at transfer to Ps 0.63 per m<sup>3</sup> in 1993. The difference in the cost of water between Coello and Saldaña may be due to the fact that in Saldaña farmers only plant rice, which has much higher demands for water than for the mixed cropping in Coello. Also Saldaña has a serious problem of siltation in the intake canal and continuously employs costly floating drag lines on boats to desilt the canal year round.

When we combine the area and volumetric fee data on an annual basis we find that the total annual cost of water per ha rose 16.9% from the mid 1950's to the period 1989-92 (from 8,620 to 10,080 pesos, in constant 1988 pesos; Table 6). However, the cost of production for the main irrigated crop (rice) rose 116% during this period. Therefore the cost of water relative to the cost of rice production fell from 4.4% to 2.4% between these periods.

Data on Coello indicates that the farmer districts were fiscally responsible in the sense that expenditures never exceeded revenues after transfer occurred. Figure 8 shows the changing patterns in levels of revenue and expenditures before and after management transfer in Coello District. During the initial stages of scheme development, expenditures exceeded revenues, partially because of external subsidies and development assistance. The early drop in revenue and expenditures was due to the transition from scheme development to scheme management. Except for 1984, between 1983 and 1992, in Coello district revenues always exceeded expenditure levels, with both showing a modest increasing trend (Table 7). Coello District revenues increased from Ps. 10,184 per ha at transfer to Ps. 13,315 per ha in 1992, a real increase of 31% over 16 years (Figure 8).

Saldaña District had a much weaker financial position, with expenditures exceeding revenues for six out of the ten years between 1983 and 1992. The level of revenue per ha in Saldaña fluctuated widely after turnover but began at Ps. 10,775 per ha in 1977 and was at almost the same level in real terms in 1992 (Figure 9). Main sources of revenue for both districts were the volumetric and area water fees.

In Coello "sideline" revenue sources--such as rental of farm equipment and district property, technical services, fines against members, sale of materials and charges for transporting equipment and materials--increased from about 10% to 20% of revenue between 1983 and 1992 (Figure 10). Maintenance costs (including relevant staff costs) account for about 55% of total expenditures in Coello District. This is followed by costs of administration and operations. The proportion of each to total costs remained roughly the same after transfer.

### **Physical Sustainability**

In both districts between 60% and 70% of all district income goes towards maintenance of the irrigation network. This percentage did not change significantly after transfer, since O&M budgets continued to be based on previous years and continued to be reviewed and approved by the agency. However, district managers reported concern that the strong farmer emphasis on cost reduction was compromising the physical sustainability of the systems.

Farmers are divided in their views as to whether the system is deteriorating. A majority of sample farmers in Coello reported no deterioration over the past ten years. However, eleven of 25 farmers in Saldaña felt that the system had deteriorated over the last ten years. The more positive perception in Coello may be due to the rehabilitation in Coello during the 1980's (see below). Since the government still claims ownership of system structures, farmers are unwilling to raise a capital replacement fund, although they do have a replacement fund for equipment.

In 1984 HIMAT, in agreement with the users, conducted feasibility studies on rehabilitation and system expansion in both Coello and Saldaña. Some portions of the canal and road network had deteriorated and were in need of repair. It was necessary to provide attention to some areas with emerging soil salinity and drainage problems. In the case of Coello the study included the expansion of area under irrigation by 30,000 ha by diverting water from the nearby Cucuana river. The rehabilitation is currently underway, with a total cost of Ps 9,750 million in 1984. Under the agreement new irrigators pay 90% of the cost via special taxes. In the case of Saldaña an expansion of 3,800 ha in the



south side of the district and the improvement of natural drains is planned. A cost of Ps 1,480 million was attached to this work which until now has only been partially implemented. Farmers refused to repay the cost for this rehabilitation.<sup>8</sup> This shows that the transfer did not result in a withdrawal of the government from taking responsibility for ensuring the long-term sustainability of the systems, even to the extent of fully financing the costs if need be. Whether this level of commitment by the government can be sustained and whether and when farmers will take on responsibility for system rehabilitation remains to be seen.

## **GENERAL LESSONS AND ISSUES**

Transfer achieved the government's objective of discontinuing subsidies and making the districts financially self-reliant for operations and maintenance.

It is apparent that the transfer did not inhibit long-term expansion of the area irrigated or the ability of irrigated agriculture to sustain high levels of rice yields. Despite rising costs of agricultural production and a decline in crop prices, yields and area irrigated remained fairly stable after the transfer. It appears not to have had a substantial impact on irrigation performance.

The districts have been only partially successful in achieving greater cost efficiency. Staff levels have been reduced 35% since transfer and area-based water fees have declined in real terms. However volumetric fee rates have risen much faster than the general rate of inflation. While Coello District was able to establish a stable favorable financial position after transfer, Saldaña has had continuing problems balancing its budget.

Farmers are much less satisfied with the irrigation service in Saldaña than in Coello, indicating concerns about water distribution, system deterioration and the continuing involvement of HIMAT. This may be partly due to the larger numbers of small holders in Saldaña, more tensions between farmers in the district and less willingness of farmers to finance irrigation adequately.

In 1990 the Government of Colombia embarked on a program to transfer full management responsibility to all irrigation districts in the country. The new Land Development Law of 1993 is intended to ensure that a proper balance of authority and responsibility for irrigation management is transferred to the water users. We hypothesize that a more complete transfer of management authority will lead to a more favorable and locally-sustainable result in Coello and Saldaña and in other irrigation systems in Colombia. The following lessons of international relevance for irrigation management transfer are supported by this study.

## **Supporting Conditions**

This study supports the view that it is more effective to create motivating conditions for farmers to take over management than it is to try to motivate and organize farmers in the absence of such conditions. Where such conditions exist, the transfer process becomes more a matter of negotiation than externally induced organizing. Key motivating conditions in Coello and Saldaña included:

- 1) an uncontested water right at the source;
- 2) legal and political recognition of the users' associations (which is now strengthened further by the new water law);
- 3) farmer investment in the systems prior to turnover, with repayment of construction costs supporting a sense of ownership in the system;
- 4) prior to turnover farmer payment of an irrigation fee which was based on the actual system-level cost of management (thus revealing to farmers the real cost of management by the government);
- 5) farmer dissatisfaction with the irrigation service prior to turnover, and
- 6) farmer expectations that they could improve responsiveness of management and cost efficiency.

The profitability of irrigated agriculture and the relative value of water are key factors which determine farmers' capacity and willingness to take over management of irrigation systems. The prospects for successful transfer are probably greater where the value of water for farmer livelihoods is most pronounced. While the cost of water relative to total production is still small in this case in Colombia, declining profit margins for irrigated agriculture could constitute a future threat to the financial viability of farmer managed irrigation. Under such circumstances, raising secondary sources of revenue constitute the replacement of public subsidies with private sector ones.

The managing agency will often be resistant to a transfer policy because it may represent a threat to its budgets, staff and influence. Hence, if a transfer policy is to be implemented effectively, it is essential to have strong political support for it. In this case, farmers lobbied with high-level politicians and obtained approval to take over management.

## **Transfer Arrangements**

Farmer organizations need full control over raising and spending revenues, hiring and firing of staff, applying sanctions, and entering into contractual relationships. The "delegation of authority" to the users association left farmers in Coello and Saldaña with the sense of incomplete control over budgets and staffing for many years. This inhibited cost efficiency and

accountability of management to farmers. HIMAT continued to supervise district budgets and restrict staff cuts. The government continued to own the infrastructure. Farmers are divided between the two districts over whether or not HIMAT should continue to be involved with them, but they share a desire to take over ownership of the infrastructure.

The government of Colombia has not had a clear policy of the terms and conditions for financing rehabilitation. Hence, farmers in the two districts have not had an incentive to raise a capital replacement fund to pay future costs of rehabilitation or system improvement. They have refused to pay for rehabilitation until the present.

Prior to declaration of a transfer policy, the government and farmers should clarify who will be responsible for financing and implementing future system rehabilitation and improvements and what terms and conditions will apply to each party. This will help prevent a tendency toward deferred maintenance and encourage farmers to raise a capital replacement fund.

### **Transfer Process**

Enactment and implementation of transfer policies should be preceded by comprehensive and participatory strategic planning which includes clear definition of future agency roles after transfer. This can also help reduce resistance to transfer by the agency, especially if new positive roles for the agency are identified to replace its prior role in system-level management (IMPISA, 1992; Vermillion, 1989). Such future roles could be allocation of water along river basins and environmental monitoring and regulation.

This case suggests that specific terms and conditions of transfer must be negotiated locally between the government and farmers. Relatively little emphasis on training and organizing farmers may be needed where farmers are already organized on the basis of construction repayment agreements and where skilled third party management staff are available to manage the systems directly under the supervision of elected farmer representatives.

### **Post-transfer Support for Local Management**

Farmers may not want total and abrupt withdrawal of government agencies after transfer. How total and how abrupt the withdrawal should be depends largely on how prepared farmers are to take over management. Negotiations between farmer representatives and agencies can define a new partner relationship.

This study and others (Svendsen & Vermillion, 1994) indicate that the strong farmer interest in cost reduction after transfer has a risk of sacrificing the physical sustainability of irrigation systems. There may be a weakness in farmers' ability to make an appropriate trade-off between cost efficiency and long-term investment. Clarity about future responsibility and the use of technical audits by external parties may be helpful in this regard. Governments may find it useful to link conditions for future assistance to performance assessments of maintenance, which can be done through technical audits.

In Coello and especially Saldaña, tensions between large and small landholders over water distribution, fee levels and other district policy questions constitute a threat to the organizational viability of the districts. Several farmers expressed the desire for HIMAT, Federriegos (the National Federation of Irrigation Districts) or other government agencies to monitor and mediate internal problems the districts experience. Local factional differences in rural populations, lack of effective accounting practices or skills and disputes over water distribution can weaken the ability of farmer organizations to provide effective and equitable irrigation services. External support from government agencies or farmer-based federated organizations may be helpful to ensure sustainability of locally managed irrigation and its adaptability to changing opportunities in their external environment. Hence sustainability of irrigation systems appears to depend not on total local self-reliance but on a new mixture of local resources and modest external support.

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## **ANNEX 1**

### **REPUBLIC OF COLOMBIA BASIC INFORMATION**

Location:	Northwest corner of South America
Area:	1'138,355 Km <sup>2</sup> (439,735 sq. miles)
Population:	31.9 million (1992 Census)
Population growth:	2 % per annum
Population density:	28 persons/Km <sup>2</sup> (or 73 persons/sq. mile)
Life Expectancy:	65 years
GNP:	US \$41,337 million dollars (1993)
Annual GNP growth:	5.4 % (1992)
GNP per capita:	US \$ 1,340
GNP distribution:	Agriculture 21%; Industry 30 %; Services 49 %.
Language:	Spanish
Currency:	Colombian peso; 1 US \$ = 825 Col Ps (Sept 1994)
Natural resources:	Petroleum, Natural Gas, Coal, Iron Ore, Gold, Emeralds, Copper, Silver
Agriculture:	Coffee, Bananas, Flowers, Sugarcane, Cotton, Rice, Cattle, Sheep



## ENDNOTES

1. Paper presented at the Internal Program Review of the International Irrigation Management Institute, November 1994.
2. The authors are agricultural engineer and social scientist, respectively, with the International Irrigation Management Institute.
3. This study was carried out in 1993-94. It involved collection of secondary data, group and individual interviews with farmers, district management staff, board members and agency staff and questionnaire-based interviews with 45 randomly-selected farmers, 20 in Coello and 25 in Saldaña.
4. See Annex 1 for additional information on Colombia.
5. In late 1993, HIMAT (Colombian Institute of Hydrology, Meteorology and Land Development) was restructured to help streamline the agricultural sector. Its new name, INAT (National Institute for Land Development), reflects its focus on developing irrigation and drainage systems. It will no longer be involved in hydrology, meteorology, and irrigation management. In Colombia the terms "land development" and "irrigation development" are synonymous. The concept of land development is defined as:

*...the construction of infrastructure facilities in order to provide an area with irrigation, drainage and/or flood protection with the purpose of increasing the productivity of the agricultural and/or animal husbandry sector....*

Irrigation districts are areas provided with irrigation, drainage and/or flood protection works.

6. Key support organizations for irrigated agriculture are:
  - IDEMA (the governments' agricultural marketing agency),
  - FEDEARROZ (the rice growers federation),
  - FENALCE (federation for other cereals),
  - FEDEALGODON (the cotton growers federation),
  - INCORA (the governments land reform agency),
  - CORPOICA (a semi-public corporation that provides technical and extension services),
  - SENA (the public agricultural training service),
  - CORTOLIMA (regional development agency),
  - INAT (formerly HIMAT)--National Institute for Land Development, the agency responsible for irrigation development and turnover in Colombia, and
  - FEDERRIEGO, (the Federation of Water Users Associations, established in late 1991, to support to farmer managed

irrigation districts; see Garcia-Betancourt, forthcoming, and Federriego, 1992).

7. Although data was verified for accuracy of recording, it appears that the conveyance efficiency figure for Saldaña for 1982 may be in error. It is unlikely to have been this low.
8. Until the present, there is no clear policy about payment for rehabilitation works for systems which will be or have been transferred to the users. The government attempts to negotiate repayment by users on a case by case basis.

**TABLE 1. BASIC INFORMATION ON COELLO AND SALDAÑA IRRIGATION DISTRICTS**

DISTRICTS	COELLO	SALDAÑA
PERIOD BUILT	1949 - 1953	1949 - 1953
DATE OF TRANSFER	SEPTEMBER 1976	SEPTEMBER 1976
DESIGN GROSS AREA (ha)	44,100	16,428
IRRIGABLE AREA (ha)	25,628	13,975
NUMBER OF FARMERS (1993)	1826	1965
WATER USERS ASSOCIATION	USOCOELLO	USOSALDAÑA
PREDOMINANT SOIL TYPE	SANDY - LOAM	CLAY AND LOAM
MAIN CROP (s)	RICE, SOYBEAN, COTTON	RICE
WATER SOURCE	COELLO RIVER	SALDAÑA RIVER
SYSTEM TYPE	RUN - OF - RIVER	RUN - OF - RIVER
INTAKE STRUCTURE	LATERAL W/RADIAL GATES	LATERAL W/RADIAL GATES
LENGTH CANAL NETWORK (km)	252	192
LENGTH MAIN CANAL (km)	100	62
HECTARES PER KM CANAL	101	73
TURNOUT TYPES	SLIDING GATES	SLIDING GATES
NUMBER STRUCTURES	81	69
UNITS OF HEAVY EQUIPMENT	43	35

**TABLE 2. NUMBER OF FARMS BY SIZE CATEGORY IN COELLO AND SALDAÑA DISTRICTS, 1968 AND 1993.**

FARM SIZE CATEGORY	1968				1993			
	COELLO		SALDAÑA		COELLO		SALDAÑA	
	# FARMS	%	# FARMS	%	# FARMS	%	# FARMS	%
0 - 5 ha	264	26.6	589	56.4	703	38.5	1255	63.9
5.1 - 10 ha	200	20.1	146	14.0	386	21.1	279	14.2
10.1 - 20 ha	207	20.8	141	13.5	300	16.4	231	11.7
20.1 - 50 ha	180	18.1	115	11.0	322	17.6	181	9.2
> 50 ha	143	14.4	54	5.1	115	6.4	19	1.0
TOTAL	994	100	1045	100	1826	100	1965	100

**TABLE 3. REHABILITATION EXPENDITURES BEFORE TURNOVER, COELLO AND SALDAÑA IRRIGATION DISTRICTS \***

(CONSTANT 1988 MILLION COLOMBIAN PESOS)

YEAR	COELLO			SALDAÑA		
	IRRIGATION	DRAINAGE	TOTAL	IRRIGATION	DRAINAGE	TOTAL
1968	155.73		155.73			
1969	564.00		564.00	204.20		204.20
1970	544.58	221.60	766.19	139.33		139.33
1971	410.59	179.65	590.24	285.91		285.91
1972	377.50	147.50	525.00		130.83	130.83
1973	294.51		294.51			
TOTALS	2346.91	548.70	2895.67	629.44	130.83	760.27

\* Years with no values indicate no rehabilitation work.

**TABLE 4. STAFF LEVELS BEFORE AND AFTER TRANSFER.**

Program	Before Turnover (1975):Coello and Saldaña districts	After Turnover (1993)		
		Coello District	Saldaña District	Both
Administration	36	18	18	36
Maintenance	161	60	50	110
Operation	51	19	24	43
Tech/Hydro/Credit	52	0*	0*	0*
Total staff members	300	97	92	189
Irrigated area (ha)	18,700	15,300	12,500	27,800
Area/staff member (ha)	62.3	157.7	135.9	147.0

\* Several Technical staff members were retained but shifted to other departments.

**TABLE 5. FARMERS ATTENDANCE IN GENERAL ASSEMBLIES**

DATE	NUMBER OF PARTICIPANTS
MAY 19, 1976 (TRANSFER PLANNING)	124
JULY 13, 1976 (TRANSFER DECISION)	446
JULY 28, 1978	295
JULY 29, 1980	280
JULY 30, 1982	281
JULY 27, 1984	232
JULY 25, 1986	262
AUGUST 26, 1988	280
OCTOBER 26, 1990	259
OCTOBER 30, 1992	201

**TABLE 6. COST OF WATER (IN 1988 COLOMBIAN PESOS), RELATIVE TO RICE PRODUCTION, BEFORE AND AFTER TRANSFER, COELLO DISTRICT \***

Period	Cost of Water/ha	Cost of Production/ha	Cost of water/Cost of Production (%)
1953-58	Ps. 8,620	Ps 194,812	4.4 %
1984-87	Ps. 6,698	Ps 334,400	2.0 %
1989-92	Ps. 10,080	Ps 421,200	2.4 %

\* In 1998, 333 Colombian pesos = 1.00 US dollar.

**TABLE 7. TOTAL REVENUE AND EXPENDITURES IN CONSTANT 1988 COLOMBIAN PESOS, COELLO AND SALDAÑA DISTRICTS, 1983 - 1992.**

YEAR	COELLO DISTRICT		SALDAÑA DISTRICT	
	TOTAL REVENUE	TOTAL EXPENDITURE	TOTAL REVENUE	TOTAL EXPENDITURE
1983	252.0	211.1	238.4	221.3
1984	235.0	236.9	233.4	218.3
1985	286.4	220.0	280.7	280.7
1986	284.8	274.9	192.6	217.3
1987	311.9	263.7	218.9	231.7
1988	311.7	264.8	215.5	252.2
1989	351.2	273.8	244.4	245.6
1990	354.0	301.1	236.9	237.5
1991	337.9	315.7	207.9	243.4
1992	361.9	318.1	307.5	241.5

*Figure 1. Locations of Coello and Saldaña districts, Colombia.*



Figure 2. Irrigated areas per year before and after transfer. Coella and Saldana Districts, 1953-1993

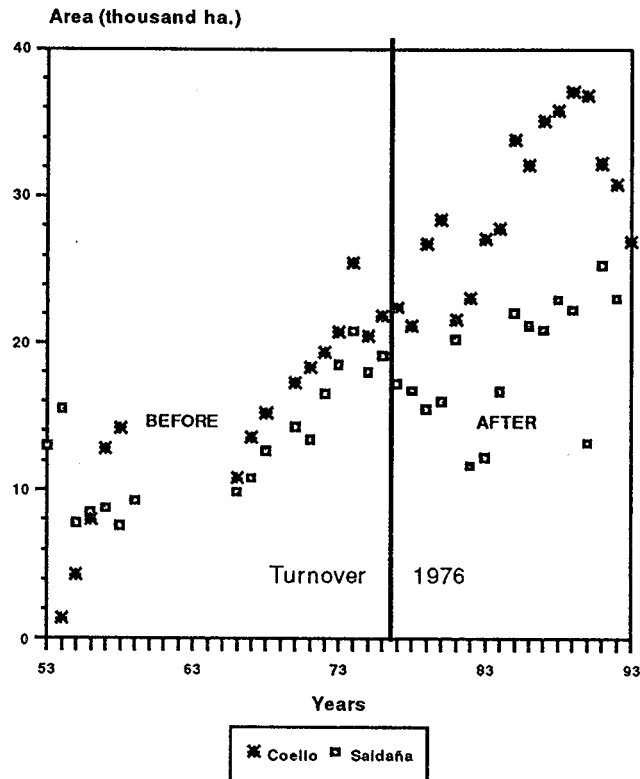
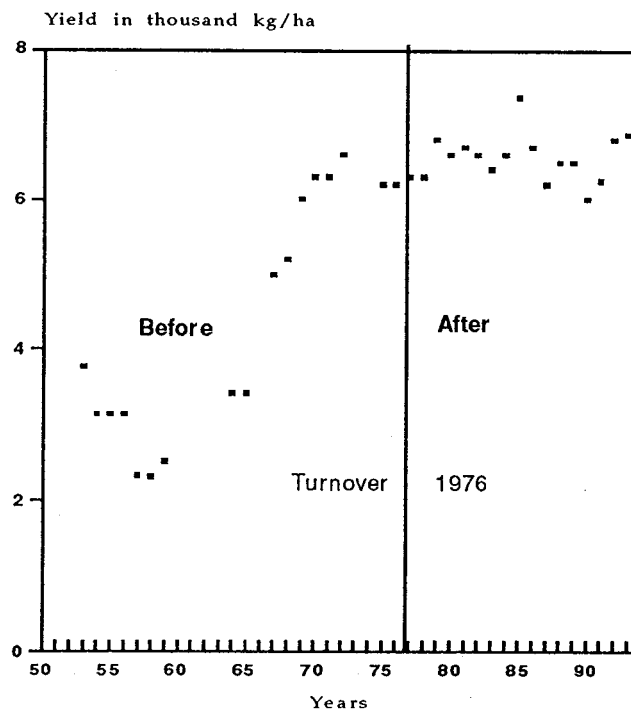
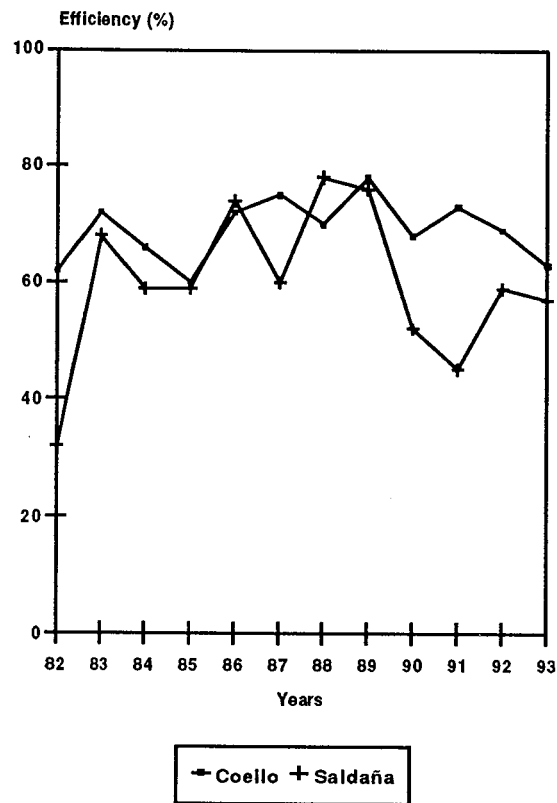


Figure 3. Average rice yields before and after turnover, Coella and Saldana Districts, 1953-93





**Figure 4. Aggregate Conveyance Efficiency, 1982-1993  
Coello and Saldana Irrigation Districts**

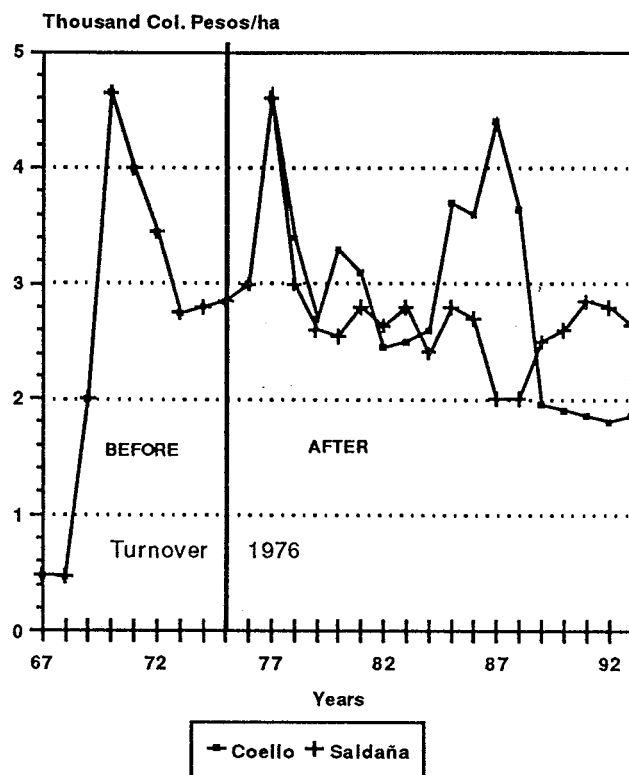


**Figure 5. Delivery Performance Ratio along a tertiary canal:  
July 15, 1993. Saldana Irrigation District**



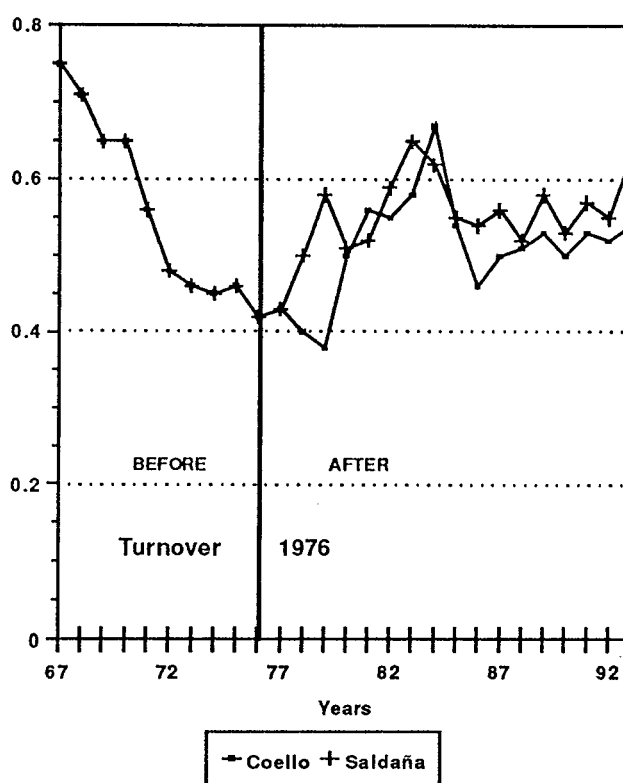
(Outlet number increases with distance from offtake)

Figure 6. Area-based water fee, Coello and Saldana Districts  
1967-1993 (in 1988 Colombian Pesos)\*



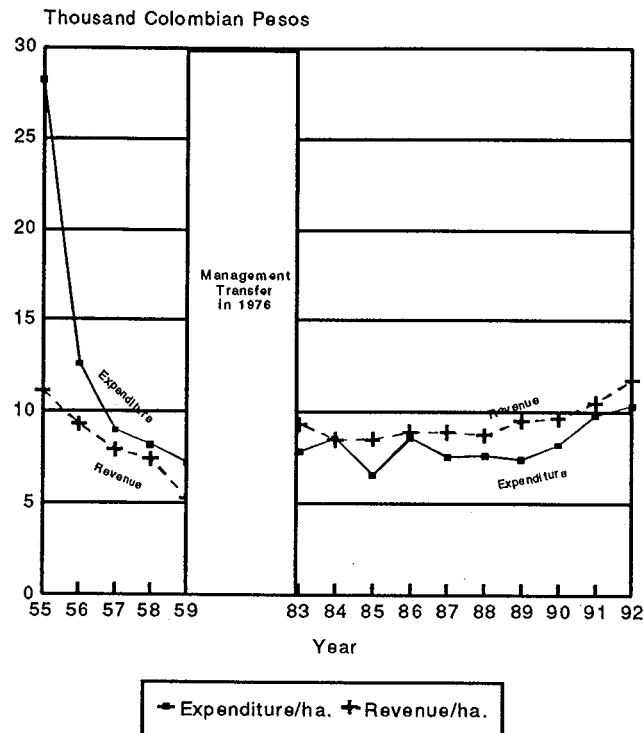
\* In 1988, 1 US\$ = Col. Ps. 333  
In 1994, 1 US\$ = Col. Ps. 800

Figure 7. Volumetric water fee, Coello and Saldana Districts  
1967-1993 (in 1988 Colombian Pesos)\*



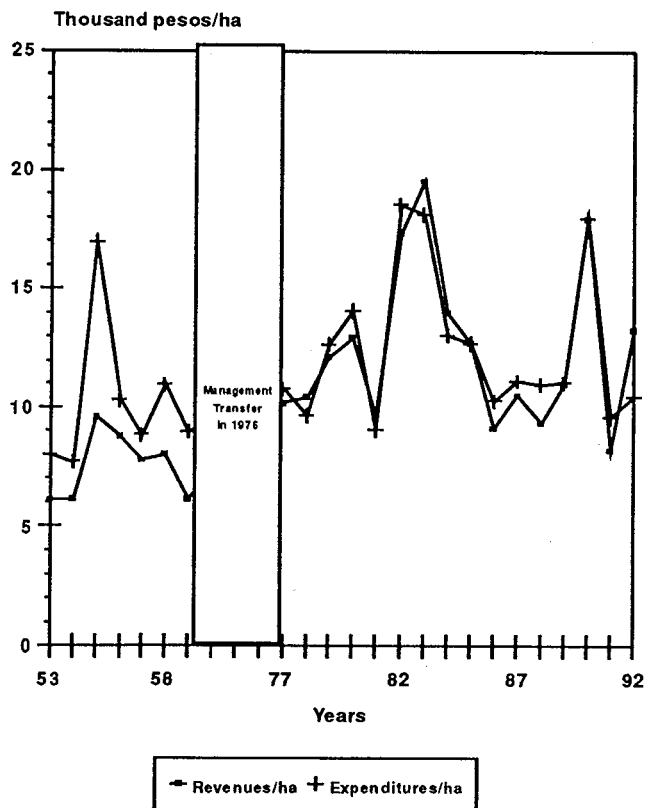
\* In 1988, 1 US\$ = Col. Ps. 333  
In 1994, 1 US\$ = Col. Ps. 800

Figure 8. Total Expenditure & Revenue per Hectare  
Coello District, 1955-93\*



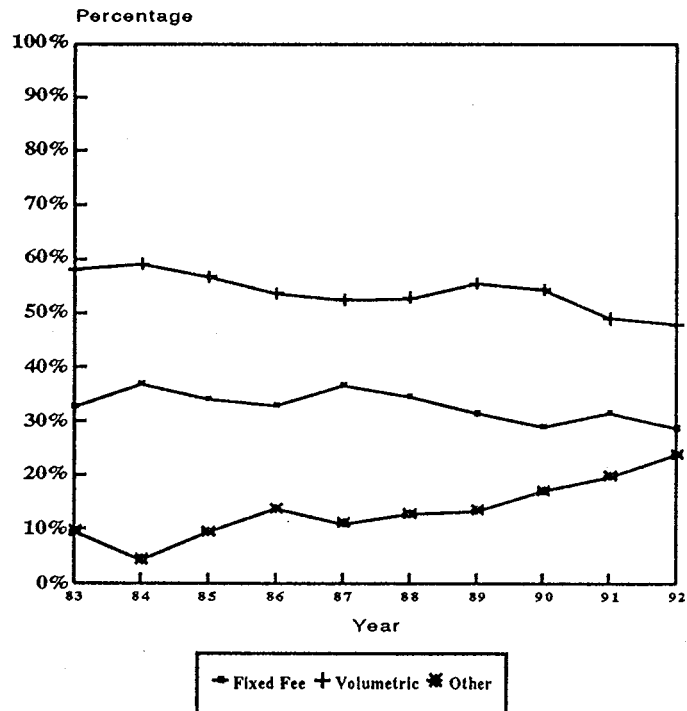
\*In constant 1988 Colombian Pesos: 1988 exchange rate was 333 Colombian Pesos per US dollar. In April 1994, exchange rate was 820 Colombian Pesos per US Dollar.

Figure 9. Total expenditures and revenues per hectare. Saldana District, 1953-1992. (in 1988 Colombian Pesos)



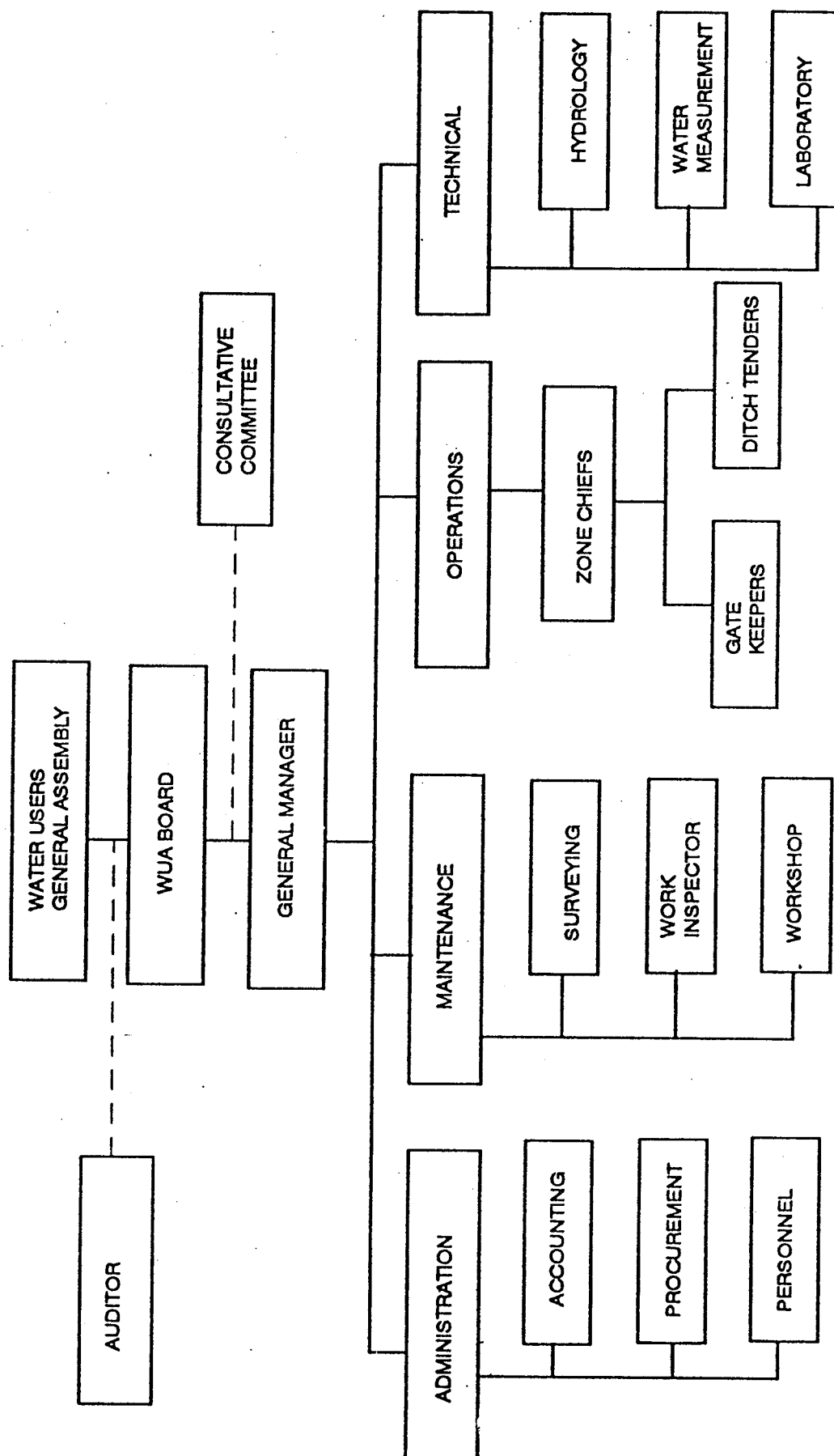
\* In 1988, 1 US\$ = Col. Ps. 333  
In 1994, 1 US\$ = Col. Ps. 800

Figure 10. Revenue Sources as Percentage of Total Revenue,  
Coello District, 1983-92\*



\*(in constant 1988 Colombian Pesos).

Chart 1. Coello District Organizational Structure\*



\* This structure is typical of other districts transferred. However, technical units are sometimes included in operations units.