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COLOMBIA

HISTORY OF THE RURAL WATER SUPPLY AND SANITATION PROGRAM

A detailed sanitary study of the country was carried out by the Ministry of Public Health, first to catalogue the villages with populations between 50 and 2,500 and second to determine the accessibility to each village; availability of suitable water supply sources; total population, health conditions; existence and condition of services including water supply, excreta disposal, electricity; types of institutions including schools, health centers, community action groups and cooperatives. The survey was used as a basis for developing a list of water supply systems which required repairs and extensions and for establishing a list of villages requiring new systems in accordance with several criteria decided upon to establish priorities.

As of December 1974, 42% of the rural population living in villages with 50 to 2,500 inhabitants had satisfactory water supply service and 10% of the population were served by sewage disposal systems.

Rural Population with Water Supply and<sup>1/</sup>  
Sewage Disposal Services - December 1974  
(Villages with 50-2500 Population)

<u>Service</u>	<u>Villages</u>		<u>Population</u>		<u>Villages</u>		<u>Population</u>	
	<u>No.</u>	<u>No.</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
Water Supply	7,100	4,025,000	2,975	42	1,672,000	42		
Sewage Disposal			660	9	402,000	10		

In addition there was a disperse population of approximately 6,000,000 people with possible 25% having adequate water supply services and 15% provided with a sanitary means for excreta disposal

<sup>1/</sup> Plan Nacional de Nutricion - Programa de Obras Sanitarias, Ministerio de Salud Publica, INAS. Oct. 1975.

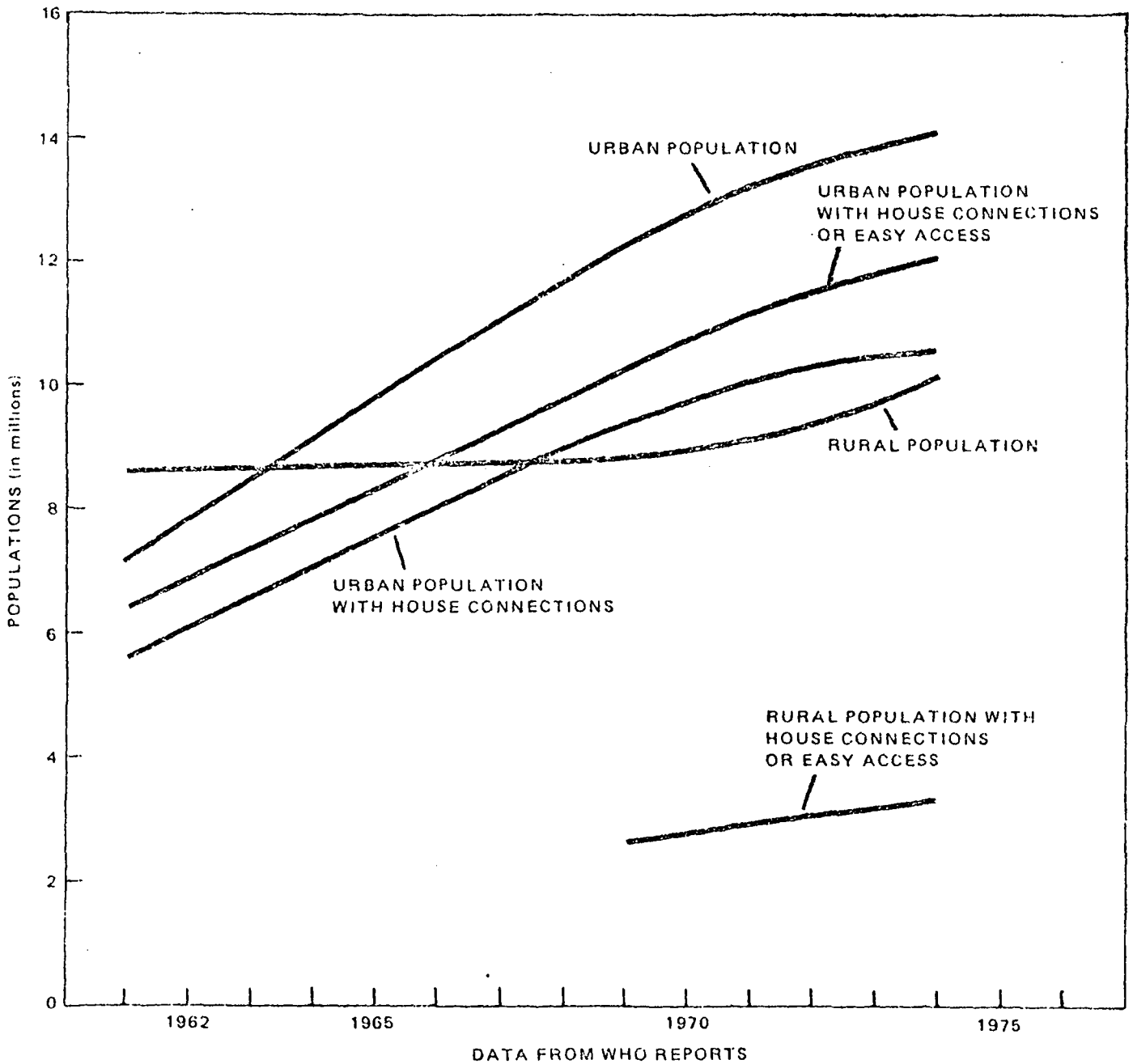
1981  
National Centre  
for Sanitation

827-18000

See Fig. I for the population growth from 1962 to 1975 and a comparison of the population with water supply services. The urban population with services through house connections has increased from 73% in 1970 to 75% in 1975 while the percentage of urban population served by public hydrants has remained unchanged. There has been a similar increase in rural population with service through house connections or with easy access to public hydrants from 30 to 33%.

Progress in the rural water supply field has been limited by the non-allocation of funds actually budgeted, and by delays in the receipt of those funds which were made available for the construction of rural water supply systems. Of the amount budgeted for construction work during 1974, only 47% was received by INAS by the end of the year and an additional 16% was received during the first quarter of 1975.

Fig. 1  
COLOMBIA  
POPULATION AND POPULATION  
WITH WATER SUPPLY SERVICES



ORGANIZATION REFORMS FOR RURAL WATER  
SUPPLY AND SANITATION SERVICES

From 1961 to 1968 the environmental sanitation programs in the rural areas of Colombia were carried out by the Ministry of Public Health. In 1968, with the advice of the Pan American Health Organization, it was decided to set up a decentralized organization in the health sector with sufficient autonomy and administrative freedom which would permit efficient handling of a national program for basic rural sanitation. The National Institute for Special Health Programs (INPES) (recently changed to the National Institute of Health - INAS) was set up in April 1968 and charged, among other responsibilities, with carrying out the Program for Basic Rural Sanitation through the Division of Basic Rural Sanitation.

See Fig. II for the organizational structure of INPES (INAS) and Fig. III for that of the Division of Basic Rural Sanitation. The Division works through a Central Office at the national level and 24 operational offices (sectional offices) at the departmental (state) level. Fig. IV gives a detail of the organization at the departmental level. See Annex A for a list of the personnel in a typical Sectional Office.

Planning, programming, evaluation and supervision activities are carried out in the Central Office. The responsibility for implementing the programs rests with the sectional offices. See Fig. V for a resume of the responsibilities at the national, sectional office and community level during the phases of study and design, construction, operation and maintenance.

STUDIES AND DESIGNS

Studies and designs scheduled by the Central Office of INAS are carried out in the Sectional Offices based on design standards developed at the national level. The designs and specifications are approved by the Central Office staff.

Fig. V  
COLOMBIA

	Studies & Design	Construction	Operation & Maintenance
<b>CENTRAL OFFICE</b>			
<b>STUDIES AND CONST. SECTION</b>	Prepares Guidelines, Manuals Plans and Schedules the Basic Rural Sanit. Prog. Establishes Standards Purchases Pipe & Fittings and Distributes to Sect. Offices Approve Design	Coordinate Construction Activities	
<b>SUPERVISION AND TECHNICAL ASSIST. SECTION</b>	Directs and Supervises the Sectional Offices Responsible for Implementing the Basic Rural Sanitation Program		
<b>PROMOTION SECTION</b>	Advises on the Process of Organizing and Motivating the Communities, also in Service Training—Prepares Manual for Promoters		
<b>SECTIONAL OFFICE ENGINEERING</b>	Responsible for Activities of Sectional Office, Implementation of the Program Makes Studies, Surveys. Prepares Designs and Plans—Approval by Cent. Off.	Supervises Construction Calculates Water Rate Varying to Suit Possibilities of Community by varying Time of Loan Repayment	Supervises Activities of Admin. Comm. including O&M
<b>PROMOTION</b>	Make Sanitation & Socio-Economic Studies Help Organize Community and Set up Admin. Comm. He is Secretary of the Comm. Assists in Contract Presentation to Community	Coordinates Activities of Administration Committee Controls Receipt of Material, Labor & Funds Contributed by Community Participate in Turning System over to Community	Continues as Secretary of Admin. Comm., Providing Liaison of Comm. and Sectional Off. on O & M and Administration of System
<b>WAREHOUSE</b>	All Purchases Except Pipe and Fittings made at Sectional Office Level	Makes Small Local Purchases, Responsible for Storing and Issuing Equip. & Materials	
<b>COMMUNITY</b>	Contracts with INAS for Const. of System	Furnishes Labor, Local Material Necessary Land	Pays Monthly Water Rate Covering Cost of O & M Depreciation and Repayment of 40% of Capital Cost of System during Length of the time Agreed Upon by Community
<b>ADMINISTRATIVE COMMITTEE</b>	Admin. Comm. is Organized with Help of Promoter	Coordinates Cooperation of Community Issues Receipts for Participation of individuals To be used as Credit Toward Cost of House Connection	
<b>OPERATOR</b>			Responsible for O & M of System Make House Comm. Repairs, Collects Water Rates when Requested by Committee

See Annex B-1,2,3 for details of construction costs for 4 gravity systems and one system supplied from a deep well. The per capita costs are shown in the following tabulation:

<u>Department</u>	<u>Type</u>	<u>Population</u>	<u>Per Capita Costs</u>		<u>Water Rate/ Mo.</u> US\$
			<u>Estimate (US\$)</u> <u>1973</u>	<u>1975</u>	
Risaralda	Gravity	3,040		22.45	1.00
"	"	288		23.58	0.76
"	"	372		44.66	
Caldas	"	438	26.12		
Magdalena	Pumped, deep- well	1,338	55.23	58.53	

The per capita costs include costs of administration at the central and sectional levels -- estimated at 15-20% of the direct costs.

#### HOUSE CONNECTIONS

Colombia is encouraging the use of house connections rather than depending on public hydrants for supplying water from piped systems. This provides for a more convenient service for which it is easier to charge and collect water rates and also gives added safety from a health point of view by supplying the water inside the house or at least in the patio, avoiding the contamination involved in hand-carrying the water in open containers from the public hydrant to the house.

A unique method has been developed by INAS to stimulate the installation of house connections and the cooperation of the community during the construction of the system. Each person cooperating in the construction by digging ditches, transporting pipe or material or finishing local material is given a dated receipt indicating the service provided and the value of that service at the local value. The worker saves these receipts and then uses them as a credit toward paying for the cost of the installation of his house connection which is estimated at Pesos 1050, plus the labor for digging and backfilling the pipe trench. The connection is made into the house if the householder desires, otherwise into the patio.

WATER RATES

The water rates for the rural water supply systems operated by INAS are based on three factors namely:

1. The cost of administration, operation and maintenance.
2. A percentage of the cost of the system to cover depreciation.
3. Repayment, with 6% interest, of the money loaned by INAS to cover about 40% of the direct cost of the construction of the system. The water rate is varied to meet the desire of the village by varying the repayment period. Some villages may want to pay off the loan in a short period of time, 4 or 5 years with a higher rate, while others may decide to use the maximum repayment period of 20 years. The rate structure for two systems is shown:

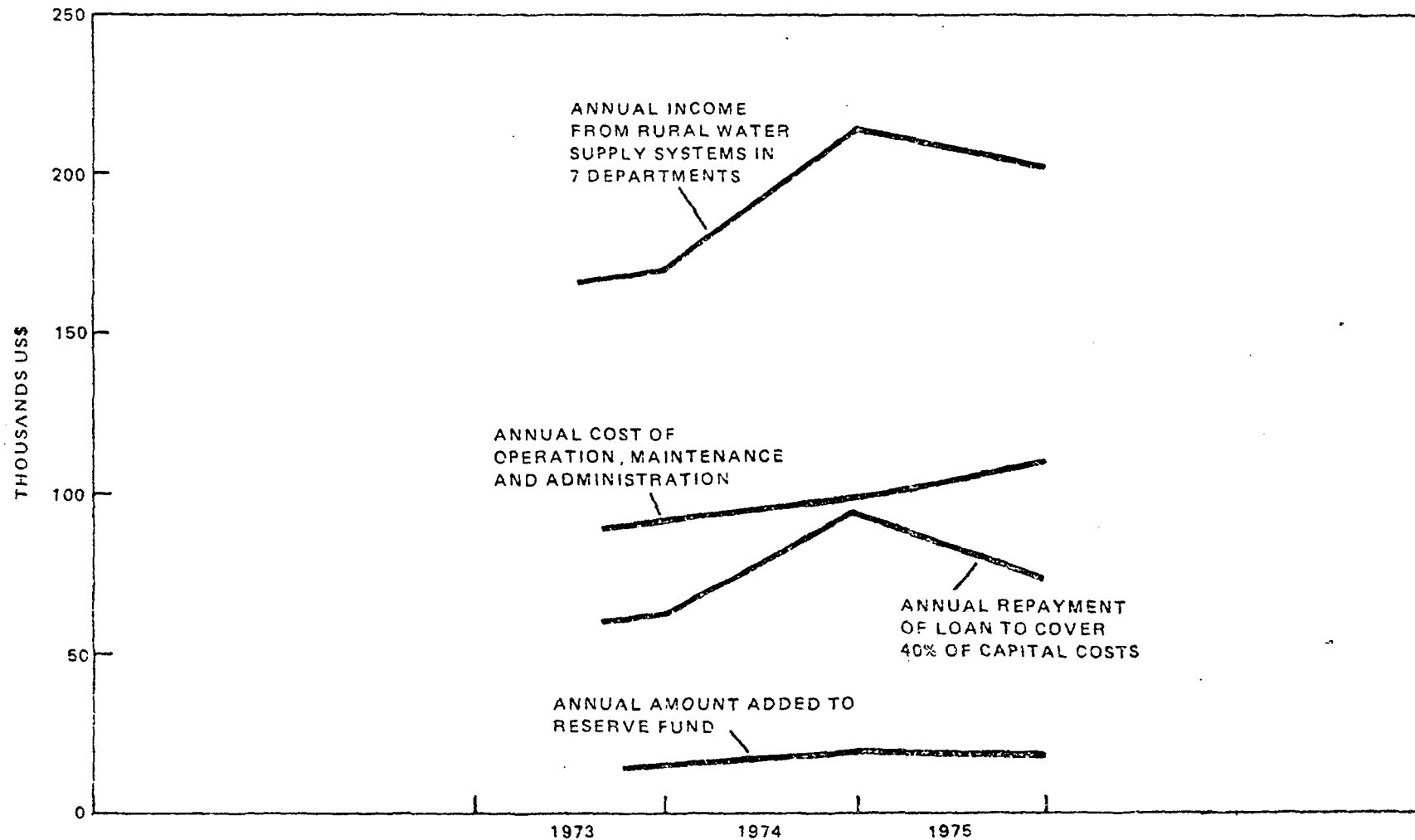
No. of House Connections	36	380
Administration	218.00	6,840
Reserve for Depreciation	194.62	1,898
Repay loan in 15 years	<u>504.47</u>	<u>3,970</u>
Total Monthly Payment	917.09	12,708
Monthly Water Rate	Col\$ 25.48	33.45

While data is not available for the cost of operating and maintaining, the systems operated by INAS in all of the departments in Colombia, it has been obtained for the systems in 7 departments and is shown in Fig. VI, with the income derived from those systems during 1973, 1974, 1975. The distribution is shown below:

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Average</u>
Operation and Maintenance %	54	47	54	52
Reserve for Depreciation %	9	9	9	9
Repayment of Loan %	37	44	37	39
Total Income COL\$	3,908,344	5,358,423	5,745,528	

Fig. VI

COLOMBIA  
ANNUAL INCOME FROM WATER SUPPLY SYSTEMS  
SUPERVISED BY INAS IN 7 DEPARTMENTS AND  
USE OF FUNDS





The reserve for depreciation is kept by the Administrative Committee while the repayment for the loan goes to a revolving fund maintained at the Sectional Level. This fund is used to pay for the construction of new systems and extensions to existing systems.

#### MATERIAL AND EQUIPMENT

The purchase of pipe and fitting is made at the national level and all other purchases are made at the Sectional Office level where material is warehoused until it is distributed to the projects as needed. Minor purchases may be made at the village level when required. Careful control is maintained of all supplies and equipment is purchased, into and out of the warehouse and onto the project until it is actually used or returned to stock.

#### PROMOTION

The promoter assigned at the Sectional Office level plays a key role in the INAS rural water supply program during all phases including the all important operation and maintenance phase. He helps carry out the socio-economic study before any promotion is started at the village level. He helps to organize the community and to set up the Administrative Committee. He helps the Committee to coordinate the activities of the community during the construction phase, receiving materials and labor, and supervising construction work during the absence of the project engineer. The promoter is usually designated as Secretary of the Committee not only during construction, but afterwards continues as well. This provides continuing contact and liaison between the village and the Sectional Office. Some of the duties of the promoter during the preliminary and construction phases of a project are shown in Fig. VII. During operation and maintenance he meets regularly with the Administrative Committee, provides the necessary guidance for the Administrative Committee, audits all accounts, checks the operation and maintenance of the system, advises the Sectional Office when assistance is needed for repairs or maintenance.

The promoters are well trained in all aspects of community organization and cooperation, as well as in the technical and financial aspects of the rural water supply projects. Most of them have been with INAS since its inception in 1968. Many of them worked as sanitary inspectors with the Ministry of Public Health before that so are well versed in the techniques of health education.

### CONSTRUCTION

Full support of the construction of a rural water supply project is given by the community through its participation in digging and backfilling the pipe trenches, transporting pipe and material, supplying local material such as sand and gravel, providing storage space and the land required for permanent structures. These activities are coordinated by the Administrative Committee with the assistance of the promoter. As mentioned under the section on house connections, those who participate during the construction stage are given receipts covering the value of the work they have contributed. These receipts serve as a credit toward the cost of the house connections to be installed in their homes.

Construction of concrete structures, pump-houses, and elevated tanks is carried out by contract. Pipe laying is often done by local labor under the guidance of an experienced pipe fitter from the Sectional Office. The Sectional Engineer or an assistant supervises construction with the assistance of the promoter. They are responsible for receiving materials and equipment and issuing it as required for construction, all with covering receipts.

Transportation is provided by the Sectional Office using its own trucks. Occasionally trucks are hired to transport material from the central warehouse, but generally this is handled by the Sectional Office equipment.

### COMMUNITY PARTICIPATION

Colombia has had a long history of community participation in self-help cooperative projects. Practically every community has a Community Action Committee for coordinating community activities. This has made it comparatively easy to obtain community organization and participation in rural water supply programs. Frequently at least one of the members of the Community Action Committee is elected to form part of the Administrative Committee which is set up as the first step toward developing a water supply project. The promoter takes part in the formation of the Administrative Committee and becomes a member of that Committee, generally serving as Secretary. See Fig. VIII for the organization of the Committee.

When the request of a village for INAS assistance in installing its water supply system is approved, the promoter makes a sanitation, socioeconomic survey of the village, a topographic survey is made, designs are prepared by the Sectional Office, a water rate is calculated and the package is presented to the community through the Administrative Committee. The community is offered a choice of several water rates depending on the length of time chosen to pay off the loan provided by INAS to help finance the capital cost of the system. A contract is signed covering the responsibility of the community and of INAS.

Construction is carried out with the assistance of the community and then the system is turned over to the community for administration, operation and maintenance under the Administrative Committee. Thus the community is involved and participate in all phases of its own water supply system.

The Committee appoints and pays an operator, a plumber and a collector to collect the water bills.

### OPERATION AND MAINTENANCE

The Administrative Committee is instructed by the engineer and the promoter in its duties for the administration and operation of its water supply system. The promoter continues as secretary of the Committee, providing continuous liaison with the Sectional Office. As problems of operation or maintenance occur beyond the capacity of the local operator, the promoter obtains assistance from the Sectional Office which has a trained staff for providing necessary assistance. When necessary, pumps and motors are sent to commercial repair shops at the department for repairs.

In a few cases three or four Sectional Offices have set up a common Operation and Maintenance Shop and Brigade to assist the communities in those departments with their problems. An attempt is being made to set up a preventive maintenance program. Spare pumps and motors are maintained in stock for installation on loan while repairs are being made on faulty equipment.

The promoter, as secretary of the Administrative Committee, participates in all aspects of administration, operation and maintenance of the system. He audits the books, helps prepare monthly reports, helps with those who are delinquent in paying their water bills and maintains continuing contact with the water supply projects which are assigned to him. Depending on the location of projects, a promoter may be responsible for 10 or 15 systems.

### FINANCING

Figure IX indicates the procedure followed in Colombia for financing the rural water supply projects designed and built by INAS. While an attempt is made to maintain the percentage of contributions and repayments as shown, each case is reviewed carefully and the percentages

decided on the basis of the capacity of the community to pay. In one of the cases cited in Annex the community provided labor and local material with an estimated value of 16% of the direct costs, and paid off a loan of 24% of the cost in 15 Years. The government provided the remaining 60% of the direct costs and paid the administrative costs estimated at 20% of the direct costs. In the second case the community's participation amounted to 22% of the direct cost in labor and local materials plus repayment of a loan amounting to 30% of the cost in 15 years. The government contributed the remaining 48% plus administrative costs.

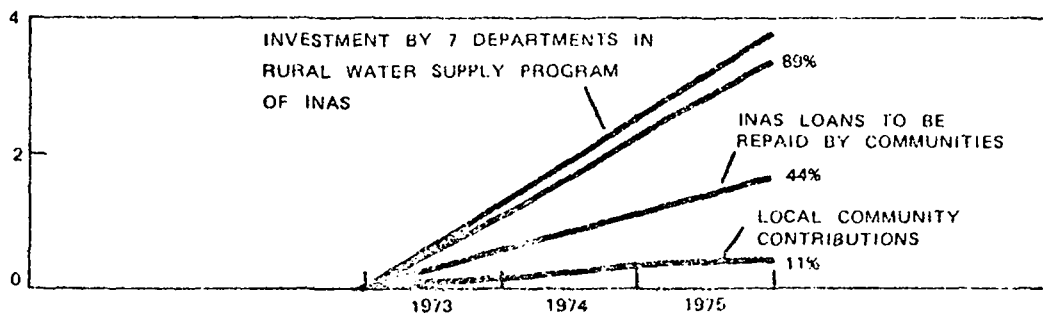
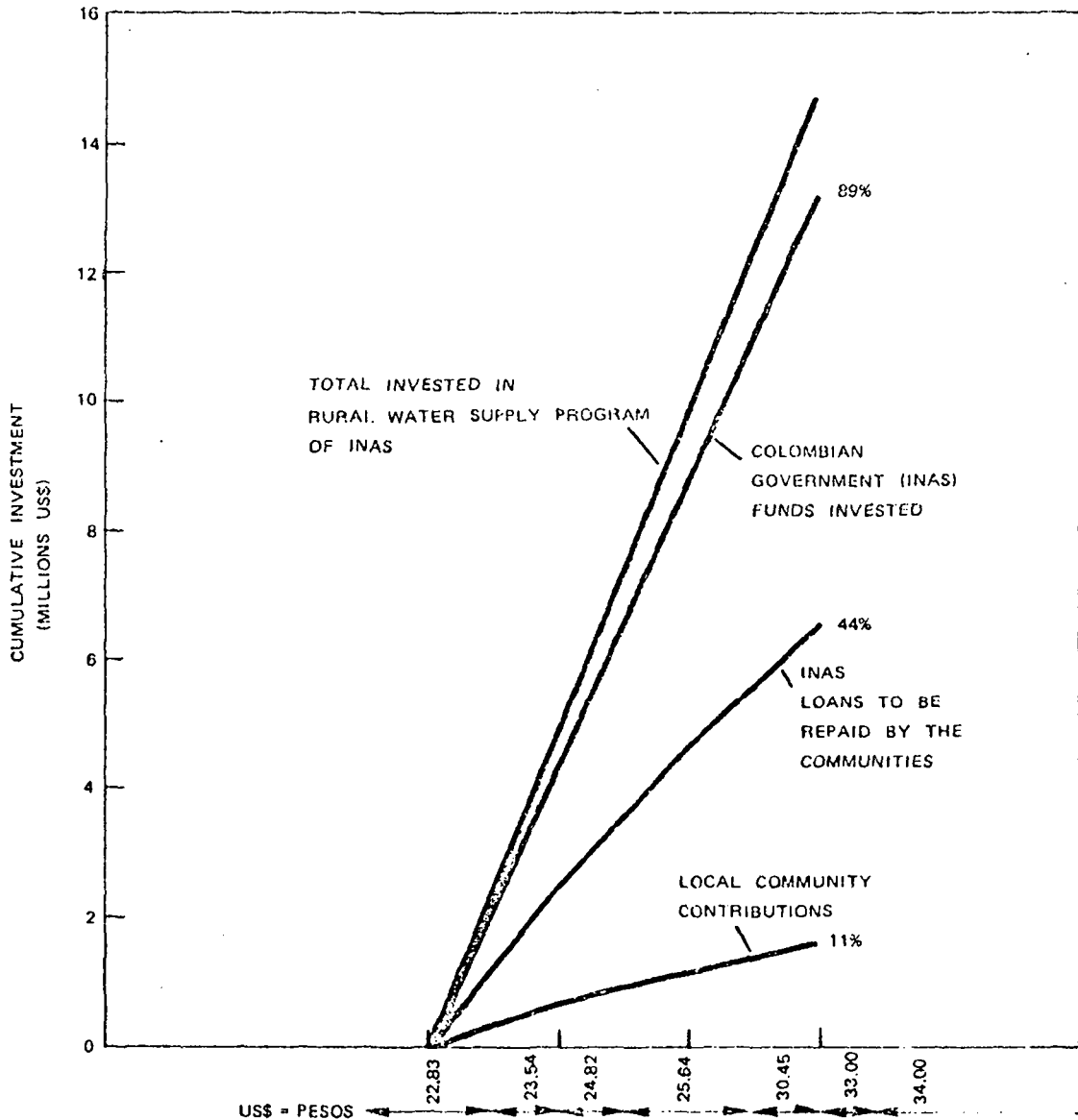
In Figure X a comparison is given of the investments by INAS during 1973, 1974 and 1975 in 7 departments with those made country-wide. For those three years the community participation amounted to 11% of the costs in local material and labor, plus 44% of the cost to be repaid. The remaining 45% was contributed by the government as a subsidy to the systems.

The funds repaid to INAS provide a revolving fund which is used to finance new construction, addition and costly repairs for existing systems.

See Figure VI for a comparison of the income from the water supply systems supervised by INAS in the same 7 departments covered in Figure, and the cost of operation, maintenance for the reserve fund and for the repayment of the INAS loans. Averaging the income and expenses for the systems in the 7 departments indicates that 52% of the cost is for operation and maintenance expenses, 9% for a reserve to cover depreciation and 39% is used to repay the INAS loans. Unfortunately data could not be obtained on a country-wide basis as it is maintained at the Sectional Office level.

Fig. X

COLOMBIA  
 NATIONAL HEALTH INSTITUTE (INAS)  
 FUNDS INVESTED IN RURAL WATER SUPPLY SYSTEMS  
 (INCLUDING PERSONAL SERVICES COSTS)  
 CUMULATIVE - MILLIONS US\$



### EXCRETA DISPOSAL

The construction and supervision of operation and maintenance of the few sewage disposal systems functioning in rural areas of Colombia is the responsibility of the Division of Basic Rural Sanitation of INAS of the Ministry of Health and the program is carried parallel to the water supply program.

The responsibility for the provision of the simpler, less expensive methods of excreta disposal is assigned to the Department of Environmental Sanitation of the Ministry of Public Health. Based on quarterly reports received by the Department from its Sectional Offices, it is estimated that only 20% of the rural houses have some type of installation for the sanitary disposal of human excreta. This Department works through the sanitation promoters and the health promoters in carrying out campaigns to improve the environmental sanitation of the people living in rural areas.

Great improvement has been made in Colombia, working with local industry, in the development of a new type of latrine fixture much more acceptable than the concrete slab and riser which was the standard for so many years in Latin America. The new fixture has a white glazed surface similar to the conventional toilet. It has a siphon which provides for a water seal and is flushed with a bucket of less than one gallon of water. It is inexpensive with an estimated cost of Pesos 100. It may be mounted inside the house and be connected to an absorption pit or septic tank outside the house, or may be mounted directly on top of the pit or tank.

Practically all of the work involved in the installations of the latrine will be done by the householder, hence the need for an active health education program to convince the householder of the need for sanitary excreta disposal and to show him how he can have this convenience

at a relatively low cost plus his own labor. This campaign is carried out by the sanitation promoter who advises the householder on where to install the latrine, size of absorption pit, installation details, also provide the latrine at a cost of Pesos 20, the Ministry absorbing the remaining Pesos 80 cost of the latrine.

Whereas gastroenteritis and diarrhea are by far the most frequent cause of hospitalization for children less than 1 year of age (50%) and 24% for children from 5-14 years, intestinal parasites and infections make up 31% of the causes for health center consultation. These infections are all the result of poor sanitation, the use of water that is not safe, and unsanitary excreta disposal. An adequate water supply must be supplemented by a sanitary means for excreta disposal, both supported by a continuing health education program.



COLOMBIA (All costs in pesos 33.50-US\$ 1.00 for 1975-1976)  
 23.54-US\$ 1.00 for 1973  
 EL JAPON, VILLAFAMBY & LA AURORA, BOSQUEMIGUADAS, RIZABALDA  
 Gravity system turned over to town.

5575 m. A.C. pipe of 6 inches and 4 inches.

No. of inhabitants in the three villages 3040

No. of houses 380

Cost of Construction

Buildings, concrete, etc. 855,321.16

Dist. systems, pipe, etc. 1,104,477.66

Administration 327,427.81

Total 2,287,226.63

Financing of Project 1,959,789.82

INDES 1,637,139.04

Loan 462,728.47 24%

Subsidy 1,175,010.57 60%

Communities 322,659.78 16%

Administrative Costs INDES 20% 327,427.81  
 2,287,226.63

Total Cost

Per Capita = 752 Pesos  
 = US\$ 22.45

Rate Structure

Administration 6840.00

Reserve for Dep. 1897.86

Repay loan @ 6%  
 in 15 years. 3970.21

Total monthly expenses 12,708.07

380 house connections @ 33.45 = 12,711.00 Pesos

US\$ 1.00

COLOMBIA

## PLAYA RICA, DOSQUEERADAS - RISARALDA

No. of Inhab.	288	Gravity system turned over to town
No. of houses	36	July 1975
Cost of Const.		500 meters conduction line 3 inch PVC
Building, concretes, etc.	81,008.57	
Dist. system, pipe	115,727.88	
Administration	30,883.61	
Total	<u>227,620.06</u>	

Financing of Project 196,736.45

INDES	154,418.05	
Loan	58,796.11	30%
Subsidy	95,621.94	48%
Community	42,318.40	

Administrative Costs

INDES	20%	154,418.05	30,883.61
			<u>227,620.06</u>

Per Capita = 790 Pesos  
= US\$ 23.58

Rate Structure

Administration	218.00
Reserve for dep.	194.62
Repay loan @ 67% in 15 years	<u>504.47</u>
Total monthly expenses	917.09
36 house connections @ 25.48 Pesos	= 917.28 Pesos
	US\$ 0.76

COLOMBIA

<u>Town</u>	<u>Municipality</u>	<u>Department</u>
LOS NEORITOS	EL BANCO	MAGDALENA
Deep well with electric motor - Inhabitants - 1338		
120 liter/cap/day		
	<u>Design</u> <u>Sept. 1973</u>	<u>Estimate</u> <u>April 1976</u>
Well and pump house	92,500	270,000
Pump and Motor	181,000	416,000
Storage Tank (Conc. 80 M <sup>3</sup> )	263,600	325,000
Distribution System	756,100	1,000,000
House Connections	<u>154,400</u>	<u>210,000</u>
Direct Cost	1,449,600	2,221,000
		<u>444,200</u>
		2,665,200
Per Capita Cost Pesos	1300	1990
US\$	55.23	58.53

CAMPOLEGRE, SANTA ROSA DE C, RISARALDA

River intake and gravity system

62 houses  
372 inhabitants 1975  
200 liter/cap/day

River intake	<u>July 1975</u> 28,600		
Conduction line	59,000		
Storage tank (Conc. 40 M <sup>3</sup> )	85,000		
Distribution system	<u>284,300</u>		
Direct Cost	456,900		
		<u>Financing</u>	
		INAS - grant	182,800
		INAS loan	182,800
		Community	91,300
			<u>456,900</u>
Administration 20%	<u>91,100</u>	Special Mat.	251,200 55%
	548,300	Not Special Mat.	90,600 20%
Per Capita cost Pesos	1474	Labor	341,800 25%
US\$	44.66		<u>115,100 25%</u>
		Total	456,900 100%

LA PAJIA, FILADELFIA, CALDAS

73 houses  
438 inhabitants Nov. 1973

River intake, gravity system

Nov. 1973

River Intake	17,100
Conduction line	47,700
Storage tank (Conc. 40 M <sup>3</sup> )	72,600
Distribution system	<u>87,000</u>
Direct Cost	224,400
Admin. 20%	<u>44,500</u>
	<u>269,300</u>

Financing

INAS - grant	74,800
INAS - loan	74,800
Community	<u>14,800</u>
	<u>224,400</u>

Special Mat. 117,500 52%

Not Special Mat. 69,600 31%

Labor 37,300 17%  
224,400 100%

Per Capita cost Pesos 615 US\$= 26.12

LA PAILA, FILADELFIA, CALDAS

73 hours  
438 inhabitants Nov. 1973

River intake, gravity system

	<u>Nov. 1973</u>		
River Intake	17,100		
Conduction line	47,700		
Storage tank (Conc. 40 M <sup>3</sup> )	72,600		
Distribution system	<u>87,000</u>	<u>Financing</u>	
Direct Cost	224,400	INAS - grant	74,800
Admin. 20%	<u>44,900</u>	INAS - loan	74,800
	<u>269,300</u>	Community	<u>44,800</u>
			<u>244,400</u>
		Special Mat.	117,500 52%
		Not Special Mat.	69,600 31%
		Labor	<u>37,300 17%</u>
			<u>224,400 100%</u>

Per Capita cost Pesos 615 US\$= 26.12

viding continuing liaison between the sectional office and the village through the Administrative Committee.

In many countries community participation is given without any incentive other than the satisfaction of helping to obtain the water supply service. The people cooperate by digging and backfilling ditches; carrying pipe and materials sometimes for miles up inaccessible mountain slopes; furnish local materials such as sand and gravel; and often by making cash contributions. In Colombia an extra incentive is provided. Each person who cooperates is given a receipt indicating his cooperation and its value. He keeps these receipts and then presents them to help pay for the cost of his house connection. This contributes to the installation of a larger percentage of house connections than happens when the individual has to pay for his house connection, even though he may be allowed to pay for it on the installment plan. As far as is known, this system is unique in Colombia.

The water bill in Colombia is based on three elements.

1. The cost of administration, operation and maintenance.
2. A percentage of the cost of the system for depreciation.
3. Repayment with 6% interest of the loan from INAS to finance the cost of the system, with the village contributing 10 to 15% of the cost in labor, local material and cash and INAS contributing the remaining 40% as a subsidy. The amount of the water bill is adjusted to the amount the users are willing to pay by varying the length of the repayment period. Some villages want to pay a higher amount and complete the repayment in 3 or 4 years, whereas other villages prefer to take the full allowable 20 years to complete repayment. The villagers are allowed to make this choice

at the time the contract for the construction of the systems is signed.

The rural water supply program in Colombia has been slowed down materially during recent years by the unavailability early in the fiscal year of national funds as budgeted. This has made it difficult to schedule the program and to use the available staff at maximum efficiency.