

NATURAL RESOURCE MANAGEMENT PAPER SERIES

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COMMUNITY-MANAGED IRRIGATION SYSTEMS:

Case Study of Arughat-Vishal Nagar Pipe Irrigation Project

S. P. Shrestha

HMG-USAID-GTZ-IDRC-FORD-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL

FOREWORD

This Natural Resource Management Paper Series is funded through the project, "Strengthening Institutional Capacity in the Food and Agricultural Sector in Nepal," a cooperative effort by the Ministry of Agriculture (MOA) of His Majesty's Government of Nepal and the Winrock International Institute for Agricultural Development. This project has been made possible by substantial financial support from the U.S. Agency for International Development (USAID), the German Agency for Technical Cooperation (GTZ), the Canadian International Development Research Centre (IDRC), and the Ford Foundation.

One of the most important activities of this project is funding for problem-oriented research by young professional staff of agricultural agencies of the MOA and related institutions, as well as by concerned individuals in the private sector. This research is carried out with the active professional assistance of the Winrock staff.

The purpose of this Natural Resource Management Paper Series is to make the results of the research activities related to natural resources available to a larger audience, and to acquaint younger staff and students with advanced methods of research and statistical analysis. It is also hoped that publication of the Series will stimulate discussion among policymakers and thereby assist in the formulation of policies which are suitable to the development of Nepal's agriculture.

The views expressed in this Research Report Series are those of the authors, and do not necessarily reflect the views of their respective parent institutions.

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COMMUNITY-MANAGED IRRIGATION SYSTEMS:
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S.P. Shrestha*

INTRODUCTION

Since 1956, when the development plan was introduced in which the government (HMG/N) gave them priority, irrigation projects have been launched all over Nepal. Despite this, only 14 percent of total arable land is irrigated. Of that, 80 percent was accomplished under community-managed systems in which HMG/N had no hand in design, operation or maintenance. Community-managed irrigation systems are more popular in the hills than in the Tarai. In the hills, 90 percent of irrigated land is community-managed; in the Tarai, 70 percent (Pradhan, 1984).

Communal irrigation systems are an important part of national development because they make use of many smaller rivers and streams not tapped by national systems. Communal systems are cheaper to construct and maintain than national systems. They also further villagers' social and economic development and create and strengthen local organization.

Communal systems, in contrast with the national system, are farmer-owned and farmer-managed. They are small scale: most schemes use logs, stones, and debris placed across the stream or river to divert water to the fields. Such structures are often destroyed during heavy rains and floods. Rebuilding them is a significant drain on farmers' capital, time, and effort.

If irrigation is to increase food production and narrow the widening gap between rich and poor, better use must be made of small streams in upland areas. Nepal may not always have enough water to irrigate aquatic plants, so small streams upland that can irrigate non-aquatic plants should be developed. The Development Club, which has tapped small streams to irrigate pakho (dry upland) land in Arughat-Vishal Nagar, is a model of what can result from such a policy.

Objectives

This paper studies the Arughat-Vishal Nagar Communal Irrigation System (AVCIS) and how it benefits the local economy. The study intended to illuminate the initiation, development, operation and maintenance of the Arughat-Vishal Nagar Pipe Irrigation project (AVPIP) and assess the project's impact in terms of cropping patterns, input demand, and community participation. The efficiency of the the Development Club in managing AVCIS was also examined.

Methodology

Information was gathered through interviews and participant observation. Club members, farmers and panchayat leaders were interviewed. Participant observation took place in a club meeting at which methods of water spraying the fields and preparing seedbeds were discussed.

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ARUGHAT-VISHAL NAGAR

The Community

The AVCIS is located in Vishal Nagar of Salyantar Village Panchayat, in the northwest region of Dhading Besi, the headquarters of Dhading District. Newars make up the largest ethnic group (56 percent) in the village, followed by Kumals (17 percent) (Table 1). The average family size is six, which is just over the the national average of 5.7.

The literacy rate (44 percent) is much higher than the national average but there are marked differences between men and women, and among castes. More than 74 percent of the Brahmin, Chhetri, Newar, and Gurung men are literate whereas no female of the Kumal, Darais, Gurungs, Damais, and Thakuris is literate.

Farm Size

Traditional agricultural practices and implements are used in the study area though some of the farmers use chemical fertilizers and improved maize seed has become popular there. Land is not equally distributed (Table 2). The Nepal Rastra Bank Agriculture Credit Survey of 1972 categorized land in the area as Lower: 0-0.5 ha, Middle: 0.5-1.0 ha, and Upper: over 1.0 ha. Thirty-two percent of Upper households own 56 percent of the land, but only nine percent belongs to 28 percent of the Lower households.

Table 1. Castes, Family Size and Literacy Rates (%)

Caste	Population	Average Family Size	Literacy	
			Male	Female
Brahmin	4.9	8.5	80.0	28.6
Chhetri	8.6	6.0	87.5	28.6
Newar	55.9	5.7	74.3	28.7
Kumal	16.9	7.4	16.1	0.0
Darai	3.2	5.5	57.1	0.0
Gurung	5.4	6.3	83.3	0.0
Damai	4.0	7.0	44.4	0.0
Thakuri	1.2	4.0	50.0	0.0
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Total	100.0	6.1	64.7	0.0

Source: S.P. Shrestha et.al., 1982.)

Table 2. Distribution of Households and Land (%)

Groups	Households	Land Owned	Average Land Holding (Ropani)
Lower	28.1	9.0	5.3
Middle	40.4	34.5	14.3
Upper	31.6	56.5	29.8

Source: Household Baseline Survey, DRCG, 1982.

Economic Situation

Agriculture is the main source of income (Table 3). It occupies 44 percent of males and 62 percent of females in the study area. Dependents constitute the second largest group in the area (37 percent). Per capita annual income in the areas agricultural sector is low; NRs.2433 in the upper group, NRs.578 in the middle group and NRs.203 in the lower group. Only the upper group exceeds the national average (DRCG, 1982).

Table 3. People in Different Activities (%)

Activities	Male	Female	Total
Agriculture	43.9	61.1	51.9
Service	13.9	0.6	7.7
Trade	1.7	0.6	0.9
Others	2.7	1.2	2.0
Dependents *	38.5	36.4	37.5

* Non-income-generating sector, including children.

Source: Field Survey

Cropping Pattern

Most farmers involved in the AVCIS practice diversified farming, planting different crops concurrently, and rotation cropping. A typical cropping pattern is:

- April/May to July/August - Maize/Paddy
- July/August to November/December - Mustard/Soyabean/Millet/
Maize/Peanut/Vegetable

A small number of farmers cultivate paddy instead of maize, but maize is popular; some cultivate it twice a year. Farmers have a choice of crops to cultivate during the monsoon season only. Usually, either millet or maize is cultivated, with mustard and soyabeans on small pieces of land. A few rich farmers with their own water pipes also cultivate vegetables for home consumption.

Rainfall

In 1984-85, the total rainfall in the area was 2714 mm, 96 percent of which was registered between April/May and Sept/Oct. No rainfall was recorded in Nov/Dec (Table 4).

Table 4. Rainfall in 1984/85, by Month

Month	Rainfall (mm)	Month	Rainfall (mm)
Jan/Feb	45.4	July/Aug	741.9
Feb/Mar	18.6	Aug/Sept	675.1
Mar/Apr	11.4	Sept/Oct	444.4
Apr/May	198.7	Oct/Nov	5.0
May/June	137.2	Nov/Dec	0.0
June/July	407.3	Dec/Jan	29.4

Pipe Network

There are only a few small streams in the AVCIS service area. Members of the Development Club constructed a small water chamber in each one. From the chambers, water is channeled through polyethylene pipes. The size of the pipe depends on the potential volume of water. There are four pipelines laid in the fields. Due to the high water volume and length of the pipes, two water tanks in Line No. 2 and 4 were constructed. (The water tank is 27'x 11'x 5'3" in Line 2 and 15'6" x 12'5" x 4'2" in Line 4.) Altogether, 4726 meters of polyethylene pipes of varying sizes have been used in the scheme.

The polyethylene pipes are joined with bamboo which makes it is easier to connect and disconnect them. To spray water, a farmer must connect the spraying pipe to the joint. After spraying, the water main should be reconnected.

THE DEVELOPMENT CLUB

Establishment

There has been a lack of local institutions to mobilize local resources and find finance from outside to develop the local community. The village panchayat never contributed sufficient resources to improve the village. Educated people either migrated to urban centers or became apathetic. As the situation deteriorated, the villagers decided that they had to do something so a meeting was called. Most of the community attended. Discussion focussed on the means to develop the village. Everybody saw the need for development but they were not sure how to do it. They agreed that they needed to:

- have an organization involved solely in village development;
- avoid political influences;
- prioritize poverty eradication programs; and
- give preference to poor and deficit groups.

Following the meeting, the farmers decided to form an organization. A constitution was prepared and a chairman chosen. He called a meeting to discuss and ratify the constitution. The Development Club (DC) was established as a non-governmental organization on May 29, 1980.

Temporary approval for the DC came from the Community Services Coordination Committee of the Social Service National Coordination Council in Kathmandu. The DC has also applied to their District Office in Kathmandu for formal registration.

The objectives laid down in the constitution are to:

- diagnose poverty, ignorance, and backwardness;
- help in national development;
- remove the inequalities between urban and rural areas;

- protect and develop occupations in rural areas;
- encourage development cadres and leadership in rural areas;
- induce participation of local people in development without indulging in politics and factional debate, and to develop civic culture by fostering patriotism among the people; and
- coordinate individuals, villages and districts in development.

Organization

The DC was organized into three levels: Central, District, and Local. At present, there are two district-level DCs in Dhading and Gorkha and 23 Development Club Local Branches (DCLB).

Central Level: A Development Club Organization Committee (DCOC) was formed as an ad hoc Central Committee to organize DCs at different levels. It will continue until a Central Committee is formed according to the DC constitution. DCOC has 11 members--seven from Dhading and four from Gorkha District. District representatives are elected by their district communities. An executive meeting is called at least once every two months and a council meeting at least once a year.

District Level: District organization has not materialized yet due to insufficient DCLB participation. The DCLBs are grouped under their respective districts. Each DCLB elects a representative to a district. There are 15 representatives in Dhading and eight in Gorkha. District group meetings should be held once a month.

Organizational Chart:

Central:	Organization Committee (11)	
	Organization Assembly (23)	
District:	Dhading District Group (15)	Gorkha District Group (8)
Local (23 Branches):	Action Committee (7)	
	General Body (over 15)	

Local Level. Villagers who are interested in becoming general members of the DC--except those who are not considered fit by the constitution--can do so by paying NRs.1 as an entrance fee and NRs.3 as an annual membership fee. Group members then elect an action committee of seven members (president, secretary, treasurer, and four members). They are elected for two years and are responsible for all activities concerned with the village. An executive meeting is held once a month and a general meeting at least twice a year.

Activities

Since its formation, the DC has carried out many activities such as irrigation, cattle control and adult literacy programs.

Irrigation: The DC set up Vishal Nagar's Pipe Network at a cost of NRs.120,000 from the Bread for the World Organization. After successful implementation, it initiated three other small pipe irrigation projects in Phadkighari, Diyaleswor, and Jalbire at a total cost of NRs.192,000 also funded by Bread for the World. All the pipe irrigation is for the winter crop. The DC has taken full responsibility for project formulation, design, implementation, and financial control.

Cattle Control: Free-range cattle were becoming a serious hazard to the crops causing disputes and misunderstanding among the villagers. The DC initiated a Cattle Control Program. Some club members visited farms to assess cattle damage and crop losses to each farmer. Cattle owners had to pay compensation and a fee to the DC for its services.

Adult Education: Since 1981, the DC has received a quota of people for its adult education program from the Social Service National Coordination Council on Community Services. The program has helped to spread literacy among village adults deprived of an education. The adult education quotas have helped the DC to open local branches in those villages and to deliver organizational and managerial elementary education to the cadres of the clubs. Altogether 265 persons (131 men and 134 women) in 13 villages have received an education.

Fund Increment Program: DCLBs run the Fund Increment Program; they deposit money into a fund and when requested, they lend it to needy club members and charge interest.

Ideals Publicity Program: The DC publicizes four ideals: nationality, monarchy, democracy, and development.

Cooperative Fund: To improve the winter harvest, the DC organized a Cooperative Fund, saving, investing and making credit, seeds, and fertilizer available to DC members. This fund now exceeds NRs.5000.

Farmers Training Program: With NRs.105,000 from Bread for the World the DC is launching a Farmers Training Program to promote literacy and teach modern agricultural techniques to member farmers.

THE COMMUNITY IRRIGATION SYSTEM

Project Initiation

The first action of the DC was to set up the Cattle Control Program. From that it made money and fired enthusiasm among farmers. Club members then turned their attention to poverty eradication. After a few meetings, they agreed that the first step was to increase farm output.

Farmers were called to a meeting to discuss methods of increasing crop yields. They concluded that triple cropping might be the best way to increase yields. To maintain this an irrigation system was essential. They saw two alternatives: gravity irrigation from the Budhi Gandaki river or pipe irrigation from small streams. With the technical knowledge available the latter seemed to be the more feasible.

Pipe irrigation on pakho land was not only new to Arughat-Vishal but also to Nepal. It was introduced by a farmer in the village who had

learned of the system while visiting a horticultural farm in India. Once the decision had been made, a pilot system was set up, covering eight ropanis of land (one ropani equals 0.13 acres). A farmer donated NRs.2000 for the purchase of 400 meters of one inch polyethylene pipe. A wheat crop was grown very successfully.

By that time, the SSNCC had extended temporary membership to the DC. It was well enough established now to write a constitution. After the successful demonstration and institutional approval, the DC began to look for funds. The chairman approached the SSNCC, the Agriculture Development Bank (ADB), and the Development Research and Communication Group (DRCG). The SSNCC were unable to help and ADB asked for a detailed report of the proposed scheme but then refused to finance the program on the grounds that it was unfeasible. However, DRCG accepted a proposal for a regional workshop to plan a "Research Project on Non-Governmental Organizations Fostering Development of Target Groups in India, Nepal and Bangladesh". It was held in Kathmandu in June 1980 and organized by the Institute of Social Studies, the Netherlands. In the end, they could not finance the irrigation scheme but Bread for the World heard of the project and approved an initial NRs.120,000 to initiate the Arughat-Vishal Pipe Irrigation Project (AVPIP).

Project Implementation

Following the agreement between DRCG and Bread for the World in February 1981, the project commenced. Because of communication problems, the location of the site and the topographical conditions, actual work could not begin until June. The target completion deadline was December 1981 but the project was not completed until October 1982. The main causes of the delay were communication difficulties, delayed transportation of pipes and cement from the factory to the project site, limited technical knowledge, monsoon rains and topographical conditions.

During construction, of the three organizations involved, only the DC was active. Bread for the World and DRCG took passive roles, reading progress reports and supervising only when necessary. The DC took full responsibility for the project.

Bread for the World: This is a donor organization with direct relations with DRCG. It acquired project information through DRCG and had little control over progress. Its functions are to:

- read periodic progress report from the DC;
- transfer funds into the DRCG project; and
- supervise the project when needed.

DRCG: DRCG mainly played the part of mediator between Bread for the World and the DC. It took full responsibility for the project by signing the financial agreement with the donor institution but did not interfere with field decisions. It allowed the DC a free hand in project management and only supervised when needed. Its main functions were to:

- obtain and pass on progress reports;
- supervise project work and check it against progress reports;
- request payment of the next installment when needed;
- provide small amounts of cash if needed; and

- conduct a household baseline survey to assess project impact.

Development Club: The DC looks after all project work. During the course of project implementation different committees and boards of the DC were called upon, the main ones being the DCOC, the Action Committee, Local Branch Arughat, and the General Body of DCLBA. The DCOC dealt with procurement of inputs, transportation supervision, and correspondence with DRCG. The Action Committee was responsible for implementing the project. The local general body was a board of general members of DCLBA which advised the Action Committee in wage determination and other policy matters. In this way these three groups were responsible for the successful implementation of the project.

The DCOC:

- procures all the necessary inputs, such as pipes and cement;
- supervises project work;
- gathers information on the progress of work and audits the accounts of the Action Committee;
- transfers local expenses details to the Action Committee depending on the progress of work;
- solves problems which cannot be solved locally;
- sends periodic progress report to DRCG;
- requests funds transfer from DRCG;
- keeps records and accounts of the project;
- assists the Action Committee in keeping accounts and records; and
- gives technical assistance.

The Action Committee:

- summons members of the General Body if problems cannot be solved by them or if matters must be discussed more widely;
- follows suggestions made by the local-level General Body;
- forwards details to DCOC if the problem is not solved by the General Body;
- hires project staff: a project manager, two assistants and laborers according to the workload;
- keeps records and accounts;
- forwards progress reports and accounts and requests funds for local expenses;
- deals with minor problems incurred by the project manager or others on the project site; and
- passes on technical knowledge from DCOC to the field.

The General Body:

- participates in meetings called by the Action Committee;
- fixes wage rates of laborers and project staff;
- fixes required qualifications for employment;
- collects information on work progress and checks accounts;
- elects executive members of Action Committee;
- dismisses executive members if they become inefficient or work against the rules and regulations of the DC; and
- makes technical suggestions for constructing water tanks, chambers, and piping work.

Table 5. Financial Statement of AVPIP, February 1981-October 1982 (NRs.)

			Budget	Expenditure
Development Club				
Polyethylene Pipes			64,500	67,657
Cement			15,000	10,050
Personnel			30,000	
Labor	20,000			
Technician	10,000			
Contingencies			10,500	4,899
			-----	-----
	Sub-total		120,000	108,000
DRCG				
Salaries (4 man/months Rs. 1200/per man/month)				4,800
Travelling Allowances				2,240
Stationery & Postage				4,960

	Sub-total			12,000
			-----	-----
Total			120,000	120,000

Source: DC Accounts

Two assistants and one project manager worked in the project office from 10:00 am to 5:00 pm. The manager received NRs.10 per day and the assistants, NRs.8 per day. They were selected by the Action Committee. Their responsibilities include controlling laborers, supervising project work, paying laborers, keeping accounts and writing progress reports. A member of the Action Committee was on site to supervise laborers and solve construction problems. He or she received NRs.10 per day.

Nobody was specified to oversee procurement, construction, reporting and external interaction. According to the committee, anyone can perform these activities. The functions and obligations of the Club chairman, secretary, and treasurer are specified by the constitution. The chairman chairs and guides meetings, and ensures that the Club's constitution is upheld. The secretary keeps minutes of the committee and general body meetings, answers letters on their behalf, calls meetings after receiving approval from the chairman, submits progress plans, reports, and programs to the committee, and initiates action on decisions with the approval of the chairman and the treasurer. The latter looks after the income and expenditure of the committee, submits financial reports at committee meetings, operates the fund with the joint signatures of the chairman and treasurer, and implements financial decisions made at meetings.

Water Distribution System

In Arughat-Vishal, only a few farmers who owned land on river banks had operated irrigation systems before. The systems were individually managed and so the community as a whole had little experience of them.

Many farmers had neither irrigation experience nor knowledge of water distribution management. They relied on monsoon rains to water the crops.

This lack of management experience remained a serious problem even after the project was completed. Each year management methods changed because sometimes the DC controlled the system and sometimes they left it to the farmers. They learned by trial and error. At the time of this study they were still confused.

1982: This was the first year of wheat cultivation; the year DCLBA took responsibility for water distribution. Executive members consulted the General Body and members of DCOC about water distribution. They discussed the issues raised and decided on a distribution system.

Farmers who wanted to cultivate wheat had to register in the office of the DCLBA. The office convener would then conduct an investigation of the land in question and rank the farmers in order of priority. The purpose of field investigation was to see whether the farmers who asked for water actually needed it. If they did, the convener gave them a spraying pipe. The farmers had to spray water at the turn allotted by the convener. Overspraying was an offense and the culprit was fined.

1983: After a year of experience, many farmers raised objections to the way the Club was being managed. Some accused members of being biased. A meeting of farmers and club members was held, at which it was decided that water distribution management be given to the farmers.

The farmers formed the Winter Crop Management Committee which was responsible for everything, from fund raising to maintenance. They hired a convener and a lineman. The distribution system remained the same; only the people were new. Some changes in fund raising and wage levels were made (see Fee Collection). The main responsibilities of the committee were to:

- decide how many linemen were needed, select them and determine their daily wage;
- select the convener;
- assess the amount of money that had to be raised; and
- solve problems and disputes during water distribution.

1984: The enthusiasm of the farmers did not last long because their system was not working. They cited lack of group spirit and leadership, and difficulties in raising money from the farmers. Many felt that responsibility for water distribution management should be given back to the Club. At a meeting between farmers and club members the system was rearranged. Much of the responsibility went back to club members but some selected tasks were left with the farmers.

Again, the system of the water distribution remained unchanged. The convener's wage was paid through other club projects. Maintenance and water supply was done by the farmers so there was no need for linemen. As a result, the financial burden on the farmers lessened. Another modification was the exemption from paying a maintenance fee for farmers who became involved in maintenance work.

In this way project management shifted from one group to another.

Each time the new managers would try to correct the weaknesses in the previous system. The latest method seems to be suitable as it tries to involve not only DC members but also farmers in maintenance of the water pipe. Payment of dues is also flexible according to voluntary contribution to maintenance work which encourages the farmers to participate.

Demand

A target was fixed of irrigating 30 ha of land but the farmers could only cultivate wheat on about 10 ha in the first year. In subsequent years wheat cultivation decreased and there the need for water decreased. In the monsoon demand for irrigated water was very low.

The DC made a rule for water supply. If there was high demand for water, the farmers could spray their crops for two hours. They were not allowed to run water onto the land. Any farmer who broke this rule had to pay a fine. If there was low demand for water the rule was relaxed and farmers were able to run water on their land for four or five hours.

Punishment

No farmers are allowed to disconnect the line. They have to wait their turn. If anyone is found disconnecting the line to get water before his or her turn they are punished with a fine of 25 paisa. The second time they are fined 50 paisa. It then doubles each time.

During a period of high demand, the DC restricts the spraying time allowed. If farmers are found to have sprayed for longer than the set time or to have run the water instead of spraying, he or she has to pay 25 paisa. The fine is doubled every subsequent time.

Convener

A temporary position in the office of the DCLBA was created during the water distribution period. The person employed is called the convener and is the executive secretary of DCLBA. If he is unable to do the work the Action Committee selects another person with the qualifications laid down by the General Body. He is paid NRs.1.50 per hour. His responsibilities include:

- registering demand for water;
- investigating needs and keeping an up-to-date list of users;
- giving and bringing back the spraying pipe;
- collecting water and pipe fees; and
- listening and passing on problems raised by the farmers.

Lineman

Linemen are hired to maintain the pipes and water supply. The number of linemen needed depends on the length of the pipe and the water load. There were two linemen each on line No.1 and 2, one on line No.3 and none on line No.4. They were selected by the Action Committee who took into consideration the qualification requirements laid down by the General Body. The linemen receive NRs.1.25 per hour and are employed to:

- clean the pipe for smooth flow of water;

- join the pipe if it becomes disconnected; and
- teach farmers how to reconnect the pipe and about spraying.

Water Rights

Water is channeled through four numbered pipelines. Three are on land belonging to the temple (guthi land) and therefore also belong to the temple, but farmers are permitted to grow their winter crops there. In the summer, the temple has the right to use the water. Until now there have been no problems with this system. Line 4 belongs to the DC.

Every farmer in the command area has a right to the water under the rules of the DC. It is not necessary to be a member but the rules must be obeyed. When the area cultivated with wheat fell far short of targets the question of water shares did not arise.

Keeping Records

A carefully maintained system of records and written rules has helped the DC to institutionalize the organization and to attract more adherents. The DCLBA is responsible for maintaining irrigation records. It keeps an up-to-date record of land holdings and annual wheat cultivation in the command area. A farmer who wants to cultivate wheat has to register with the Club. Minutes of each meeting are well kept. Financial accounts are maintained. All accounts are presented to the general assembly of DC for approval. The Club's funds are deposited at the Rastriya Baniya Bank. The account is operated by the joint signatures of the chairman and the treasurer.

System Maintenance

The maintenance of pipes, water chambers and tanks has been the responsibility of the DC except for the year when farmers themselves managed the system. The executive members plan, prepare schedules, mobilize the human resources and specify the works to be done.

Generally, the annual meeting of the Action Committee is held in October and at that time a date is set for repairs and desilting. The cost of this maintenance is charged to the wheat farmers. From this year the Club will exempt those farmers who help with the maintenance work. As it is easier to maintain pipes than canals not much emphasis is laid on repairs. Once repairs and desilting work is finished the responsibility of maintaining a supply of water lies with the linemen.

Fee Collection

The responsibility of fee collection has shifted from one group to another as did management of the water distribution. The system and fee level changes every year.

During the first year of wheat cultivation, when the DC took responsibility for fee collection no money was collected at all. The total expense was born by the Club from remaining project funds. In the second year, when water distribution was done by the Winter Crop Management Committee, they collected the fees. The amount depended on farmers' land holdings.

In the third year, the DC was again responsible for fee collection. They called the water and pipe fee and calculated it per ropani and also on which line was being used. Some lines needed more linemen to maintain them and here the fee was higher:

Line 1: NRs.15 per ropani (two linemen); Line 2: NRs.15 per ropani (two)
Line 3: NRs.10 per ropani (one lineman); Line 4: NRs.5 per ropani (none)

The DCLBA created a special fund in 1983 called the Winter Crop Management Fund. Money from all sources connected with the winter crop (also renting irrigated water to a brick factory and horticultural center) was deposited here and now there is about NRs.2000 in the fund. It is spent on wages, maintenance and repair.

Problems

Inefficiency in the Club was often caused by conflict, particularly where political views differed. Usually these problems sorted themselves out; if not they were referred to the DCOC. Where the conflict involved groups, the decision was made in favor of the majority.

Politics: There were still some strong feelings left from the Referendum in 1980, that split Arughat village into two factions. The leader of one became a ward leader in the panchayat system and the other became chairman of the DC. Their continued rivalry almost resulted in the failure of this scheme: the ward leader tried to prevent the scheme even though he had land in the command area, and he encouraged others to boycott the project, but they could not afford to do this.

Doubt: At the beginning it was difficult to motivate people because many farmers doubted the feasibility of the project. They were unsure that a non-government organization would succeed in development.

Training: The DCOC chairman trained the DCLBA chairman in accounting instead of the treasurer. This was necessary because the treasurer was not interested in the project at the beginning and was susceptible to manipulation. He and the secretary objected and both later resigned.

Wages: Laborers constructing water chambers and pipelines were paid at a rate, set by the general assembly, of NRs.10 for a skilled worker and NRs.8 for an unskilled worker. Wages were necessarily lower than in other nearby irrigation projects implemented by the International Labor Organization. This caused discontent. They were mollified by an additional NRs.2 which paid for their midday meal.

Water Supply: Once the system was built, water was supplied to wheat cultivators. The biggest landowner in the command area, who had not contributed to the project, tried to get water first. Other farmers complained but the DCLBA could not solve the problem. The DCOC grouped the farmers into deficit, balanced and surplus groups. In the first group were those without sufficient food for the year; just sufficient farmers were in the balanced group and those with more were in the third group. Water would be supplied to each group in turn, starting with deficit farmers. Each group was divided into sub-groups of members and non-members. This system was accepted by the majority, but the main

landowner tried to raise a fuss. When the panchayat leader joined the majority, he stopped complaining, but still will not support the system.

Farmers' Participation

All club members are farmers. They participate in decision making, implementation and evaluation. Bread for the World and DRCG does not interfere unless they have to. The DC is totally responsible for administration and coordination. A project manager and two assistants supervise administration and DC members coordinate activities themselves.

The Project was formulated entirely by the DC and farmers in the area. They received no outside help, even with the technical details. All decisions--initial, operational, long-term--are made by the DC section responsible and are taken on a majority vote.

Evaluation is also done by the DC. Progress is reviewed at an executive meeting generally held once an month. Obstacles that are not overcome during this discussion meeting are passed on to the general body.

There are, however, several problems. AVPIP was designed by farmers and the limited technical knowledge they possessed was not sufficient to allow construction to proceed smoothly. When the pipelines were first completed, the water did not flow. The idea of building a tank came later. Work was done by trial and error and thus it cost the DC extra time and money.

DC members misjudged how much money they would need and where it would come from. The farmers' participation did not include voluntary contributions to the fund. All wages were paid out of the fund and all members received a wage. In the planning stage, attention had been focussed on completing the project successfully and not on what the farmers could reasonably be expected to contribute in monetary terms.

Although 30 farmers enrolled as DC members (now there are 50), many did not. This created problems when decisions had to be made that did not include them, but did affect them. Membership was never made a precondition to receiving water and although members got paid, this was not enough to attract the more apathetic farmers in the command area.

No women became members at the beginning and therefore none participated in the initial work. This was not by rule of the DC, but the women had other tasks that kept them busy, and society did not permit their involvement. Since then, the villagers reconsidered and there are now ten female members of the DCLB. One woman was elected to be an executive member, but when her term ended, she was not re-elected.

Relations Between Panchayat and DC

Relations between the panchayat and the DC have been good. There was one clash over water supply between the panchayat worker and the DC chairman over distribution quantity and timing but it was more personal than political.

Panchayat workers in the command area have ignored the project, neither supporting it nor complaining about it. Some felt that project

funds should have been channelled through the panchayat office as it is responsible for the overall development of the panchayat and a more legal body than the DC. However, nobody sympathized with this view. Farmers were only interested in results. Because the DC was a democratic organization, the panchayat workers had little influence.

Some panchayat workers felt humiliated by the DC. Within a short time, the Club's activities had expanded successfully; the panchayat's annual budget was NRs.100,000, whereas the budget of the DCLB alone exceeded this figure.

The DC is theoretically apolitical. They did not reject any willing farmer despite his ideology, provided he worked for the Club's objectives. The constitution has a written aim "to induce participation of all on the development path without indulging in politics and groupism".

IMPACT OF THE PROJECT

Cropping Pattern

The project had little impact on cropping patterns in the command area, which are basically the same as elsewhere in the hills except that they add a third winter crop. This is usually wheat (85 percent of the winter crop), but may be vegetables (10 percent), or mustard and tobacco (5 percent). Vegetable farming increases every year.

Of the three categories of farmer in the command area, the deficit and balanced groups prefer to cultivate wheat, primarily to increase their income, whereas the surplus group, who were motivated more by taste and personal preference, grew vegetables. Before the pipelines were operational, conditions were not suitable for vegetable cultivation. Irrigation has had a positive affect on vegetable yield.

Credit and Input Demand

Triple cropping has increased land productivity. However, although output went up, the number of cultivators of a third winter crop has fallen. In the first year ten ha were planted and this fell first to eight and then six ha. Reasons for giving up wheat cultivation included:

- it affects the maize crop;
- villagers' food habits do not include wheat;
- it requires extra investment that they cannot afford; and
- initially improved seed and fertilizers were unavailable.

Maize is the main crop grown and the inhabitants will not grow another at the expense of maize. Some farmers complained that chemical fertilizers needed for wheat reduced the quality of the soil. The DC executive members refused to accept this. They felt sure it was a lack of credit and inputs that caused the fall in wheat cultivation. Farmers who approached financial institutions for loans were refused. Most were illiterate which made them feel uneasy about the bureaucratic procedures in commercial banks. They prefer to remain indifferent. Delivery of

improved wheat seeds and chemical fertilizers was very unreliable and thus it was too risky for farmers to plan on cultivating wheat.

Cooperative Fund: Once these factors were identified, the DC set up a fund to overcome the problems. The main objectives were to:

- arrange punctual delivery of seed and fertilizer, giving priority to the deficit group;
- buy the wheat produced by Club members;
- make a habit of saving and investing; and
- encourage a cooperative approach by distributing 50 percent of the fund profits to shareholders.

Any member can invest in the fund, either by buying shares or bonds. If he invests in shares, at NRs.10 each, he will get an equivalent proportion of 50 percent of the fund profits, and with bonds he receives 20 percent interest on the money invested. They may invest individually, as a group, or as an institution.

To operate the fund there is a special committee of seven members who were selected from the shareholders. Three must represent the institutional holders. There is also a paid manager who runs an office and implements decisions taken by the committee. His functions include keeping a minute book of meetings, administering the fund, and calling meetings with the chairman's approval.

According to the constitution of the Cooperative Fund, the manager has to follow the direction of the committee. He will use some money to buy wheat from the farmers when it has been harvested, at a price fixed by the committee, and will try to sell it at a profit. He also has to make sure the chemical fertilizer is available once a month, on time.

The fund has now reached NRs.5000. Many farmers are interested in investing spare cash they may have, but because the idea is new they are also cautious. If the fund is operated well, it will increase the availability of credit which may increase wheat cultivation, and also encourage farmers to buy shares, thereby saving instead of spending.

Community Participation

Successful implementation of AVPIP has encouraged local people to participate in other development work. It has prompted similar irrigation schemes in three other places in Dhading District, all with financial assistance from Bread for the World, the main objective being to enable triple cropping. Three more are planned for this year.

At the start there were four DC local branches. Now there are 25. Nearby villages that have heard about the scheme want to set up their own DCLB in the hope that eventually they will be singled out for a construction project. However, only the DCOC has the authority to open DCLBs. They assess the need and quality of potential leadership, but will not open a branch until they are convinced that people are genuinely interested.

Local people are becoming more eager to participate but this is limited to project implementation. Nobody has tried to start their own project, independent of the DC.

The success of the project also caused Alternative Technology International (ATI), Washington, to offer a loan of one million rupees for the construction of a pipe system in Salyantar. The command area was about 80 ha and the payback period on the loan was 20 years; therefore the farmers would owe NRs.32 per ropani per year. However, the farmers rejected the offer because:

- they hope to get financial assistance from the German Agency for Technical Cooperation (GTZ) which is planning a major project in Dhading although it has so far not been involved with the DC;
- they did not want to have a loan burden for 20 years when they may get a system built with aid money; and
- the DC builds the system free of charge, except for labor.

SUMMARY AND CONCLUSIONS

The Development Club in Arughat-Vishal Nagar, with the objective of reducing poverty, ignorance and backwardness, took the initiative and formulated an irrigation project. It demonstrated on a small scale how small streams in upland areas, which are usually overlooked as agricultural water sources, can be used in the winter to enable three crops to be grown and output to expand.

The DC took full responsibility for the project, from initial planning and fund raising to successful operation. Due to the limited technical knowledge of the farmers, construction took longer than planned, but it was completed.

Limited knowledge of water management in the command area has caused confusion as to who will be in control of daily operations in the long term. As with construction, trial and error will show them the best method. Maintenance of a pipe system is not as complicated as with gravity irrigation because of the use of polyethylene pipes and the small land area.

Problems have arisen often but they are usually solved among Club members. If not, they were discussed with the DCOC. Among the issues raised were the amount and collection of fees, wage disputes and minor political problems. The latter were minimized by a policy of depoliticization, particularly where the panchayat was concerned.

The impact on cropping patterns was minimal. The DC encouraged farmers to grow wheat as a third winter crop and for those who were reluctant because of the cost and unreliable delivery of improved seeds and chemical fertilizers, a Cooperative Fund was set up. Farmers could buy shares or bonds and thereby earned dividends on their money. Capital in the fund was loaned at low rates of interest when needed. The operators of the fund bought all the wheat produced.

The DC encouraged local participation in the project and similar efforts began to take place elsewhere under its control and the control of local branches.

The initiative displayed by the DC should be encouraged but time and money would be saved with some technical input from outside. Nevertheless, with training and experience the local people will soon develop technical skills themselves. Such projects should, as far as possible, be allowed to operate without interference; the government should make sure the panchayat officials do not attempt political manipulation.

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