

## **IRRIGATION MANAGEMENT NETWORK**

### **THE DESIGN OF FARMER MANAGED IRRIGATION SYSTEMS: EXPERIENCES FROM ZIMBABWE**

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# **THE DESIGN OF FARMER MANAGED IRRIGATIONS SYSTEMS: EXPERIENCES FROM ZIMBABWE**

**J M Makadho**

## **1 SUMMARY**

This paper discusses experience with the design of farmer managed irrigation systems in Zimbabwe. In the National Farmers Irrigation Fund (NFIF) programme farmers meet the costs for infield infrastructural development, operation and maintenance. Farmers have participated in various ways in the process of planning, design and implementation of projects. Initially, formal and informal discussions are held through which the farmers' willingness to irrigate is assessed. Farmers are given a chance to express their opinions about the crops they want to irrigate, and the methods of irrigation they prefer. Farmers are also physically involved by providing labour for some activities like fencing, trench digging, pipe laying, refilling trenches, bush clearance and canal construction.

The government, through the Department of Agricultural Technical and Extension Services (Agritex), provides engineers and extension officers who assess irrigation potential and hold discussions with farmers on alternative irrigation methods and cropping patterns. As much effort as possible is put into consultations with farmers to see that the majority agree on the course of action to be implemented.

It has been observed that participation by farmers through discussions shapes the farmers' attitudes and prepares them for the hard work involved in irrigation. Their physical involvement in some of the scheme works has built in them a feeling of belonging and responsibility for the scheme.

Irrigation engineers have, through discussions with farmers worked out design alternatives that suit the farmers' needs and expectations. When the designs are implemented the observations made so far have shown that the farmers respond well to the management procedures introduced. Because of the two way communication between farmers and engineers/extension officers in the process of developing farmer managed irrigation schemes, problems and misunderstanding that affect scheme management are minimised.

## 2 INTRODUCTION

It is becoming increasingly accepted that small-holder irrigation development, being concerned with people and not just land, water and money, requires a human approach. This human approach, in the context of this paper, refers to maximum farmer involvement in every possible way throughout the planning, design and implementation phases.

Many projects in Zimbabwe have been established with very little prior involvement by the beneficiaries. These projects are managed by a structured government organisation on behalf of the settled small-holders. This approach gives rise to numerous problems that are a result of lack of commitment and responsibilities by the farmers. Farmers look on the irrigation scheme as belonging to government in which case their commitment is very superficial. Lack of farmer participation has been documented as one of the major contributory factors to poor performance (Bagadion 1986, Canewatte 1988, IIMI 1986). Involving farmers is an approach that has been tried in many third world countries and has proved promising and appropriate. Perhaps the question that has to be asked is: "how and when to involve farmers?"

This paper will specifically discuss the following issues under Zimbabwean conditions:

- i. activities in which farmers and government can get involved at some stages of the project cycle, i.e. planning, design and implementation;
- ii. factors that facilitate the mobilisation of farmers and enhance maximum farmer involvement in developing 'their' project;
- iii. some advantages and disadvantages of involving farmers;
- iv. the benefits for involving farmers.

### **3 BACKGROUND INFORMATION ON SMALL-HOLDER IRRIGATION SCHEMES IN ZIMBABWE**

Some 74 small-holder schemes were established by government in communal areas between 1912 and 1980. These range in size from 2 to 400 ha. More schemes have been built after independence in 1980 and today small-holder schemes cover about 5,500 ha or 4% of the total irrigated area in Zimbabwe. In 1988 only 54 schemes were operational, i.e. operating all or part of their command area. Various factors have contributed to the non-operational status of the 22 schemes which have been abandoned. These range from non-availability of spare parts for diesel engines, silted dams, the security situation in some parts of the country and general dissatisfaction by the irrigators.

The maintenance charges currently applicable range from Z\$145/ha/year for schemes with an assured water supply and growing two crops in one year to Z\$30/ha/year in all sand abstraction schemes.<sup>1</sup> An investigation done by government through a study carried out by consultants has shown that in the 1985-86 financial year, total operation and maintenance costs on the small-holder schemes averaged Z\$780 per irrigated hectare. Therefore the present irrigation fee of Z\$145/ha/year covers 19% of the average operation and maintenance costs. This is indicative of the level of government subsidy requirements in running the small-holder schemes.

Subsidies for investment in irrigation schemes are a one off item which can be increased or decreased depending on availability of government funds. Subsidies of the operation and maintenance (O&M) costs of irrigation schemes are on-going commitments which increase with inflation. Government is committed to increasing the pace of irrigation development on one hand and is also committed to reducing subsidies on the other. Since farmers are not able to pay for all the capital costs for irrigation development, subsidies for scheme investment will continue to be needed. But the costs of O&M cannot be subsidised forever. This highlights the necessity for handing some of the financial responsibilities to the farmers; and this has to cover a greater part if not all the O&M costs. Therefore a funding procedure had to be

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<sup>1</sup>1989: One US dollar is equivalent to 2.25 Zimbabwe dollars.

developed which removes the financial commitment to O&M costs by government.

#### **4 THE NATIONAL FARM IRRIGATION FUND (NFIF)**

In view of the high development costs and the inevitable government subsidies to sustain the schemes, a new funding approach was introduced by forming the NFIF in 1985. This is a revolving fund administered by the Agricultural Finance Corporation (AFC). The fund is designed in such a way that farmers have a role to play by meeting part of the capital investment costs and all the O&M costs. The provisions of the fund under small-holder development are as follows:

- a. government provides a grant for head works, i.e. from source to field edge under the Irrigation Support Fund (ISF);
- b. farmers borrow for infield infrastructural development for new projects from the NFIF;
- c. the scheme has got to be financially viable to be eligible for funding under the NFIF;
- d. farmers should organise themselves into groups and borrow as a group - individual borrowing is not encouraged;
- e. the interest rate for the money borrowed is 9.75% payable over 10 years, (this rate of interest is lower than the usual rate of 13% under normal AFC programmes);
- f. the farmers should grow some crops marketed through statutory bodies like the Grain Marketing Board, so that AFC can make a stop order arrangement and recover their money on a regular basis;
- g. payment should be effected soon after the first crop, i.e. no grace period is granted for either interest or repayments of capital.

## **5 EXPERIENCES ENCOUNTERED IN LAUNCHING THE NFIF PROGRAMME**

Initially farmers were not keen to embark on the programme. For at least two years no scheme was implemented under the NFIF programme. This could be attributed mainly to the following:

- i. irrigation is a new style of life to most communal area farmers. The condition of group borrowing was not popular since many felt they can not trust each other when put in a situation where they owe large sums of money as a group. Group borrowing is a new concept to the farmers. A lot of farmers need some time to organise themselves and fully understand the provisions of the fund because group borrowing could badly affect their families in cases of sudden death, for example;
- ii. the majority of existing small-holder schemes have been fully funded by government including more than 80% of the O&M costs. The introduction of the NFIF is contradictory in a way to the precedent already set. It is not easy to convince farmers to borrow money under the NFIF when the existing schemes are fully funded by government grants.
- iii. the lack of a grace period and the commitment to grow crops marketed through statutory bodies, are some of the factors that make the fund less attractive on first hearing.

However, despite the above constraints, to date (October 1989) the Irrigation Division of Agritex has planned and designed 22 schemes, 10 of which are fully operational. These are fully operated and managed by the farmers. The Irrigation Division under the NFIF programme is responsible for identifying irrigation potential, planning, designing and implementation of irrigation projects for the small-holder farmers. In view of the experiences encountered in launching the NFIF programme, the Irrigation Division adopted the approach in which farmers participated as much as possible in all activities of developing the project. This approach is described below as follows:

After having identified the water resources and irrigable area in a given district, a series of farmer meetings are arranged to discuss with farmers as openly as possible the identified irrigation potential



in their area. The benefits of irrigated agriculture are explained to them. In some cases field trips are arranged to visit existing schemes and let the farmers see for themselves and discuss with other fellow farmers and share experiences.

The provisions of the NFIF programme are explained to the farmers. Cropping programmes and marketing outlets for the produce are determined in consultation with the farmers. If farmers' crop choices are not agronomically feasible in terms of rotations and disease control, further discussions are held to make the farmers appreciate the inappropriateness of their choices.

The hard work involved in irrigation is discussed, for example that it entails at least two crops per year, carrying out the irrigation properly, weeding, maintenance of the infrastructure, operating equipment and managing activities that require communal effort. The levels of financial and labour requirements are mentioned in general.

After several meetings with farmers to discuss the above aspects, they are given time to digest and discuss among themselves.

Further meetings are then scheduled to assess the genuine interest and commitment by the farmers. Farmers, with the assistance from extension staff, draft a constitution and bye-laws that would guide the members in handling the day-to-day affairs of the project. An irrigation management committee is formed, members of which are voted in by the farmers. This committee will be a representative body for the farmers. The major positions are: Chairperson, Secretary and Treasurer. All the bye-laws and disciplinary measures will be enforced by the Committee. The willing farmers show their commitment and acceptance by putting their signatures on paper.

Once the farmers have committed themselves the engineers from the Irrigation Division start on the topo-surveys and detailed soil survey and analysis. Detailed designs for infield works with bill of quantities for alternative irrigation systems are prepared. The alternative designs are explained to the farmers, i.e. the advantages and disadvantages of each in terms of method of operation, capital cost (which farmers have to borrow under the NFIF programme), replacement costs, operational costs and management requirements. The alternative designs usually include drag-hose, semi-portable

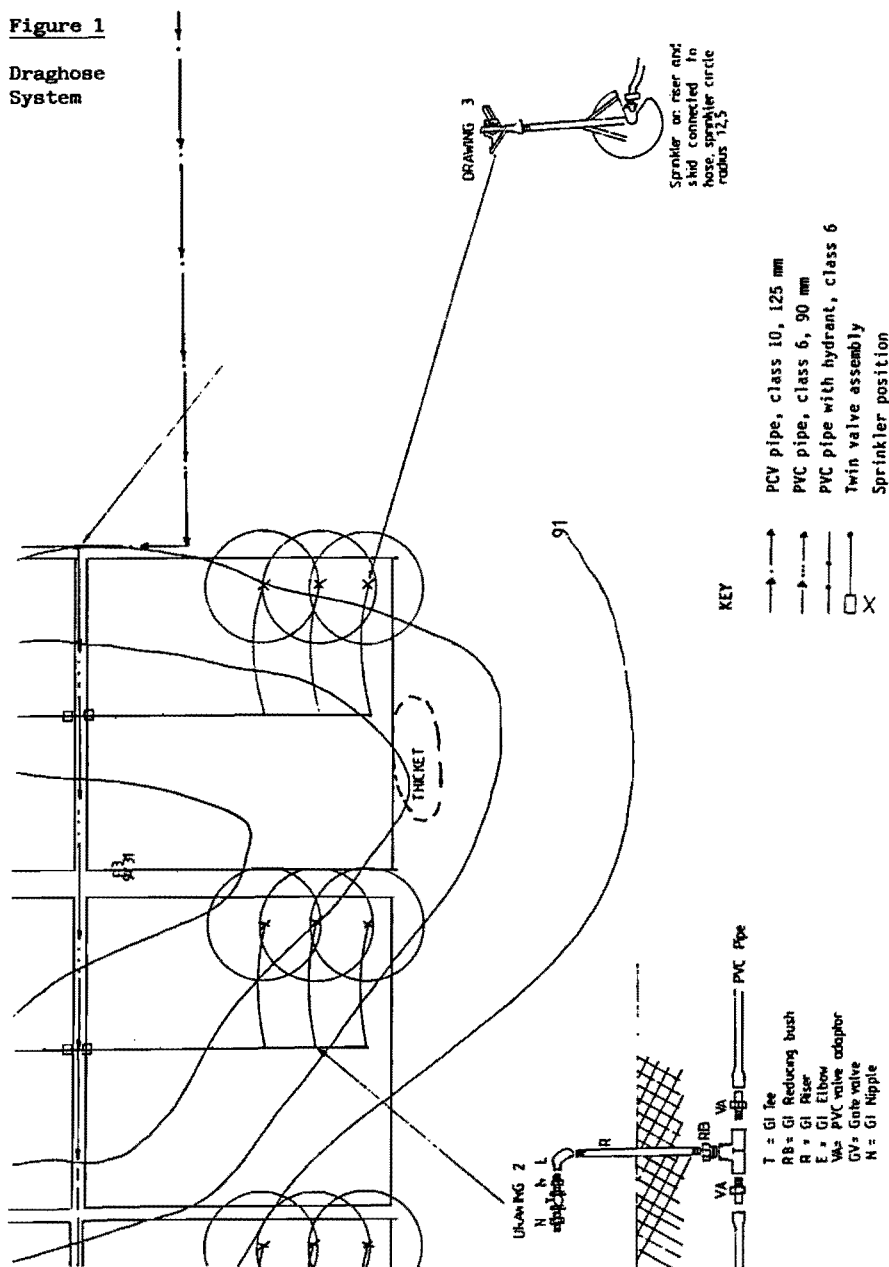
sprinkler system and where possible a surface irrigation option. Designs are made in such a way that they accommodate the farmers expectations as much as possible. For example, with a cooperative approach irrigation takes place in a block system whereby all sprinklers are located in one block of land at a time. Although this increases the number of lateral lines or hydrants in comparison with the drag-hose and semi-portable systems it allows the farmer to irrigate one crop efficiently. With individual plots under a sprinkler drag-hose system each farmer has his/her own equipment for which he/she is responsible. Each plot receives the same volume of water regardless of its location within the irrigated area. With surface options farmers have the choice of one individual plot for all crops along one field canal or having one crop grown together with other farmers along one field canal - in a block farm - but still maintaining small individual plots.

The reasons for choosing a particular design alternative by farmers can be many and include capital and operation costs, previous experience with certain system of irrigation, whether equipment is shared or not. The drag hose system is very popular with most farmers because they prefer to own and use their own equipment in the field without sharing. It should be emphasised that in both cases, the systems are locally manufactured in Zimbabwe, although they use imported materials. In the drag-hose system, the main pipeline and the distributaries are buried pvc pipe. The farmer connects his own sprinklers to the risers with his own flexible pvc hose, which he can drag to other positions in order to water his whole plot. The infield costs of this system, illustrated in Figure 1, are Z\$2,000-3,000 per ha (about US\$900 to \$1,300 per ha). The semi-portable system has aluminium piping and has 3 sprinklers attached. It can be moved, in cooperation with others. It would cost Z\$4,000-5,000 per ha if each farmer was provided with his own equipment, so sharing is advisable to reduce the cost.

When the most appropriate design is finally chosen by the farmers, their physical involvement is called upon. They provide labour for fencing the scheme and bush clearance. They dig trenches for piping if need be and provide labour for canal construction.

The discussions with the farmers are important for shaping their attitudes through which they develop a feeling of ownership for the project. Because farmers will have contributed by giving their opinion in the process of developing the irrigation they feel they

Figure 1

Draghose  
System

are an important part of the process of developing the irrigation scheme. This is consolidated further by the financial commitment and the provision of labour for some activities during implementation.

On the other hand, government provides the engineers who identify the irrigation potential and initiate the project. The engineers plan the project to detailed designs, supervise construction and make the necessary tendering procedures. Through the extension staff farmers get advice and training on record keeping, water management, agronomy and general operational procedures of the equipment. Farmers are further advised on marketing and procurement of agricultural inputs.

The provision of unskilled labour by the farmers teaches the farmers how to carry out construction works which in turn will help them when repair and maintenance works have to be carried out. For example farmers have already been able to repair PCV and A/C pipes during the first seasons of operation in schemes in Mutoko.

A comparison between Insukamini Irrigation Scheme (designed without involving farmers) and Tagarika Irrigation scheme (designed under the NFIF programme) demonstrates the difference. Insukamini was designed as if it were a commercial farm subdivided into one hectare plots. It was designed for monoculture with farmers sharing sprinkler laterals. However, farmers have started growing crops that were not included in the design. The crop water requirements under the 'farmers' cropping programme is different from what the equipment can supply. Problems are encountered in scheduling irrigation for people sharing equipment and growing three different crops in a given plot. If farmers were involved in the planning process their wishes to grow more than one crop at a time and to have their own equipment would have been included in the design.

At Tagarika Irrigation Scheme farmers are growing crops they want, they own their infield equipment and because they have been party to the development of the project farmers are more responsible in handling equipment and more responsive to extension advice given them.

When the scheme is finally implemented farmers are trained in running the pump house, irrigation cycles and scheduling. During the first season efforts are made to visit the scheme on a daily basis by extension staff; to give technical advice on irrigation, agronomy and organizational issues such as acquisition of inputs and disposal of produce to market. The yields obtained during the first year of operation are encouraging: maize up to 8 tonnes/ha, potatoes up to 20 tonnes/ha, onion 30 tonnes/ha, cabbage 40 tonnes/ha.

The farmer participatory approach has been applied at 22 different schemes involving some 484 families. Ten of the schemes have been constructed in which some 240 families are engaged in irrigated farming. The observations made in these schemes are encouraging. These are given below as follows:

- i. the level of farmer commitment and responsibility is fairly high. This is evidenced by the fact that none of the irrigators have outstanding debts;
- ii. all the equipment and infrastructure have been operated and maintained reasonably well by the farmers;
- iii. farmers have been able to make minor repairs on their own on broken pipes, leaking canals and hydrants.

## **6 FACTORS THAT FACILITATE THE MOBILISATION OF FARMERS AND ENHANCE MAXIMUM PARTICIPATION IN DEVELOPING THEIR PROJECT**

The foregoing discussion has highlighted that a two way communication between farmers and government professional officers is an important prerequisite. The farmers have to be convinced of the importance of their participation. This was put forward to the farmers by expressing their importance of their involvement so that what ever scheme is finally implemented they understand and appreciate why certain decisions were taken.

The irrigators have to get motivated to participate and the incentives for participation have to be visible, tangible and achievable. This is achieved by taking farmers to existing schemes to appreciate the benefits that can be accrued from irrigation. The Department provides transport to and from the existing scheme but

it does not supervise the visit. The visiting farmers are left here for a week by themselves, so that they have plenty of time for observation and discussion with the host farmers. After their return home they are left to talk with their colleagues for a week or ten days, before the Department staff return to continue the dialogue. After seeing what other farmers can do and achieve, the farmers in the new project got motivated and gained confidence in their new venture.

Problems emerge where close integration of technical, and institutional activities is lacking. The irrigation system should be developed simultaneously with the management capabilities and organisational skills among the irrigators. Farmer involvement in the planning, design and construction activities enhances the farmers' understanding of how the scheme would operate. Furthermore, farmer participation in making decisions and carrying out certain tasks is the basis for building group solidarity and imparting technical and social skills that will make the group activities effective in the long run.

Farmers can be easily motivated by looking forward to some benefits in various forms that can be obtained from the project. Motivation of government personnel is a neglected issue. Government personnel should be motivated enough to be wholeheartedly committed in promoting farmer participation. The question is: "how can government personnel be made accountable for effective farmer involvement, and what incentives are available for government personnel?" This is an area where government can play a significant role.

## 7 CONCLUSION

Government has started on the right course of action through which grants and subsidies are reduced by placing financial responsibility into the hands of farmers. The question is: "can the farmers sustain the system when wholly handed over to them, and what does the future hold for these newly developed farmer managed irrigation systems?" This is only the beginning, all the parties concerned are still in a learning situation and what has transpired so far is promising and encouraging. A monitoring and evaluation programme to look into these schemes as they grow has been set up. The observations of the Monitoring and Evaluation unit will

generate information that will be useful in developing future schemes. Problems and constraints that affect farmer managed systems will be highlighted and their causes identified. The good aspects of the systems that should be maintained and replicated in other locations will be noted.

Already, we can make certain observations from the Zimbabwean case which are worth highlighting:

- i. organising people is not easy because the process, in this Zimbabwean case, involves changing the peoples' culture, habits and values. Irrigation is a new style of life which seeks to evolve people's lives from subsistence agriculture to cash-cropping. This calls for maximum commitment from all parties concerned. Farmer participation does not involve only physical work, it also has a lot to do with the psychology of the farmers, their attitudes, and level of motivation. A high level of motivation is required;
- ii. the cooperative approach to design and management, which involves sharing equipment has not proved popular in the NFIF programme. Farmers prefer individual responsibility for using and replacing infield equipment. The accountability inherent in the drag-hose system, designed so that sharing of infield equipment is eliminated, encourages farmers to use equipment more carefully. This can only be decided by the farmers themselves after discussing alternative designs with them;
- iii. on schemes that have been implemented so far, there is some evidence to show that farmer participation through the provision of information on their needs and expectations enables the designer to do the following:
  - a. produce a design that can accommodate the farmers needs and requirements in terms of crops, ownership of equipment, labour availability, operational procedures such as irrigating at night, etc;
  - b. produce a design that when finally put on the ground can be operated and maintained by farmers with minimum supervision.

These are some of the contributory factors to management problems and poor scheme performance if they are not clarified with the farmers during the planning and design stages.

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