Water for Agriculture in Zimbabwe

Policy and Management Options for the Smallholder Sector

Edited by
Emmanuel Manzungu, Aidan Senzanje and Pieter van der Zaag

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September 1998

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CHAPTER 6

Key steps in the development of community gardens using limited groundwater resources

C. J. Lovell, E. P. Mazhangara, M. Murata and O. Mugweni

Shortage of water is the main problem reported by communities living in southern Zimbabwe. Rainfall is erratic and unreliable and the area is prone to drought. In Masvingo Province, there is a recorded density of only one water point per 17 square kilometres. Of these, 40 per cent are known to fail during drought. For some communities the priority is for a cleaner and more reliable source of domestic water. For many it is for sufficient water to allow vegetables to be grown. There is a tradition of gardening and a need for water and vegetables in this region upon which development of community gardens using groundwater can build.

A pilot project "Small scale irrigation using collector wells" has recently been completed in Masvingo Province. Supported by the Government of Zimbabwe and the British Overseas Development Administration, the project has addressed the priority objectives of nutrition and health, poverty alleviation and income generation in these drier areas. It was based on, and integrated, two main areas of research: the benefits of collector wells for abstracting water from problem aquifers such as those of basement rocks predominant in this region, and the benefits of efficient utilisation of limited water resources for small scale vegetable production.

Results to date indicate that:

a) groundwater resources in southern Zimbabwe are sufficient in magnitude to support both domestic requirements and small scale vegetable production,
b) collector wells (and other well designs in some areas) are able to abstract the volume of water required for this type of scheme,
c) the schemes are highly valued by communities for provision of both domestic water and irrigation water, and
d) community-based irrigation can be viable from a social, institutional and economic point of view.

The project has allowed implementation of one of the most comprehensive comparisons of alternative well designs and detailed assessments of social,

economic, institutional and environmental viability of community-based irrigation ever undertaken in Africa. Further details of all aspects studied are provided in a series of project reports (Brown and Dube, 1994; Butterworth *et al*, 1995; Lovell *et al*, 1996; Mazhangara *et al*, 1995; Murata *et al*, 1994, 1995; Thompson and Lovell, 1995; Waughray *et al*, 1995). This chapter concentrates on a part of this work — the costs and benefits of collector well gardens, and the sequence of steps now known to be important to successful development of this type of scheme, paying particular attention to steps which can help to ensure successful collaboration with communities and implementation of schemes more likely to be sustainable from a social perspective.

COSTS AND BENEFITS OF COLLECTOR WELL GARDENS

Groundwater in southern Zimbabwe is currently abstracted either by traditional dug wells or deep boreholes sited using geophysics. Low yields and poor drilling success rates are typified by a recent Drought Relief Programme — only 21 per cent of boreholes gave yields of 0.6 l/s or higher and 18 per cent were dry. A collector well is designed for use in crystalline basement rock. It is a large diameter well, sited by exploratory drilling, whose yield is enhanced by lateral drilling at the base to a distance of up to 30 metres in several directions. At all pilot project sites, a consistently adequate supply of water for domestic use and small-scale vegetable production was obtained using collector wells. Table 6.1 provides a comparison of costs to provide the required 15 m^3 of water per day using different well designs (Lovell *et al*, 1996).

Table 6.1: Costs of providing 15m^3 of water per day using different well designs

Scheme type	Interest Rate (%) Construction	Profit (%) Amortisation	Cost (Z$)	ACC (Z$/$m^3$)	
1 collector well and 2 handpumps	13	13	0	77 107	2.57
2 conventional boreholes and 2 handpumps	13	13	0	98 040	3.27
1 conventional borehole and motorpump	13	13	0	90 857	3.03

The schemes are highly valued by the communities for their provision of reliable domestic water and sufficient irrigation water. An estimated 3, 882 people obtain their domestic water from the six project wells, consuming approximately 13 litres per person per day. The estimated population of households directly involved in the six community gardens is 4, 461 people,

with a mean income generated per member per year of Z$255.20 (Waughray *et al*, 1995). The schemes are economically viable and water use efficient, with an average IRR in 1994 of 19 per cent, average total gross margin per hectare per year of Z$24, 000, and average gross margin per unit of water (Z$/ha/m) of $43, 800 per scheme. They provide extensive marketing opportunities for the sale of dry season vegetables to surrounding townships and play an important role in improving the welfare of women and children by making more efficient use of labour time, improving nutrition, and providing an important source of disposable income for household items and school fees.

In essence, the collector well gardens have reduced the period of scarcity of fresh vegetables that communities in the area face by four to five months, lowered the number of people who feel there is a period of fresh vegetables scarcity by about 25 per cent, and decreased the time during scarce periods that people miss out on eating fresh vegetables by about four days in every week. Price increases for plots in the gardens indicate the degree of welfare improvement the schemes are now bringing to members. Many people, originally disinterested are now wishing to join, to the extent that there is a willingness to pay up to 16 per cent of a year's income from rainfed crops to join the schemes and benefit from the steady revenue they can provide.

KEY STEPS DURING DEVELOPMENT OF COMMUNITY-BASED IRRIGATION

It should be noted, however, that the implementation of community-based development initiatives is not easy, and many factors can influence final scheme performance. Local ownership of the resource is one vital ingredient. Local communities are much more likely to look after and pay for the upkeep of their water points and gardens if they know that they belong to them and not to the donor or to another agency. An important corollary of this is that the community is involved at all stages of the resource development, from its inception, through planning and construction, to subsequent maintenance and management.

Valuable lessons learnt at first pilot schemes led to significant improvements in implementation of later schemes. The key steps now known to be important in development of community gardens using groundwater are shown in Figure 6.1. These are not intended as a prescription but rather as a checklist. The exact order and importance of the steps will vary to some extent between different areas and between different communities, but in southern Zimbabwe the sequence shown has been found helpful in promoting successful collaboration with communities and in implementing schemes more likely to be sustainable from a social perspective. The following notes are provided for those steps where community participation is a key element:

(1) Project Area: Although there can be no substitute for genuine community interest and commitment, undertaking schemes on a ward-by-ward (a ward is

Figure 6.1: Key steps to be taken in development of community gardens using ground water

Hypothetical Target: 250 farmer-managed community gardens in Southern Zimbabwe

Irrigated using ground water. Each garden to be 0.5 ha or larger and to serve upward to 50 families. Each will require a minimum of 15 cubic metres of water per day (including domestic water) abstracted using the most appropriate well design determined for the area.

Define Programme Area, e.g. Masvingo Province

▼

Select one District at a time, e.g. Zaka

▼

Liaise with District Development Committees in order to:
- Identify ongoing and proposed water development projects, e.g. dams, boreholes, irrigation schemes, water and sanitation programmes
- Avoid duplication of effort or possible conflict of interests
- Collate hydrogeological data for existing wells and boreholes
- Identify Wards where present programme would appear appropriate based on need, hydrogeology, viability of other types of surface water development project

▼

Consider one Ward at a time, e.g. Bota South (1)

▼

Liaise with WADCO and field staff of Agritex and DDF in order to:
- Confirm status of water supplies and gardens in the Ward
- Identify potential communities or VIDCOs based on need and anticipated community interests

▼

Visit selected communities or VIDCOs, e.g. Gondora

▼

First community meeting and site visit to assess:
- Existing sources of water (visit plus hydrogeological records)
- Community need (2)
- Community interest
- Community structure

▼

Figure 6.1 (continued)

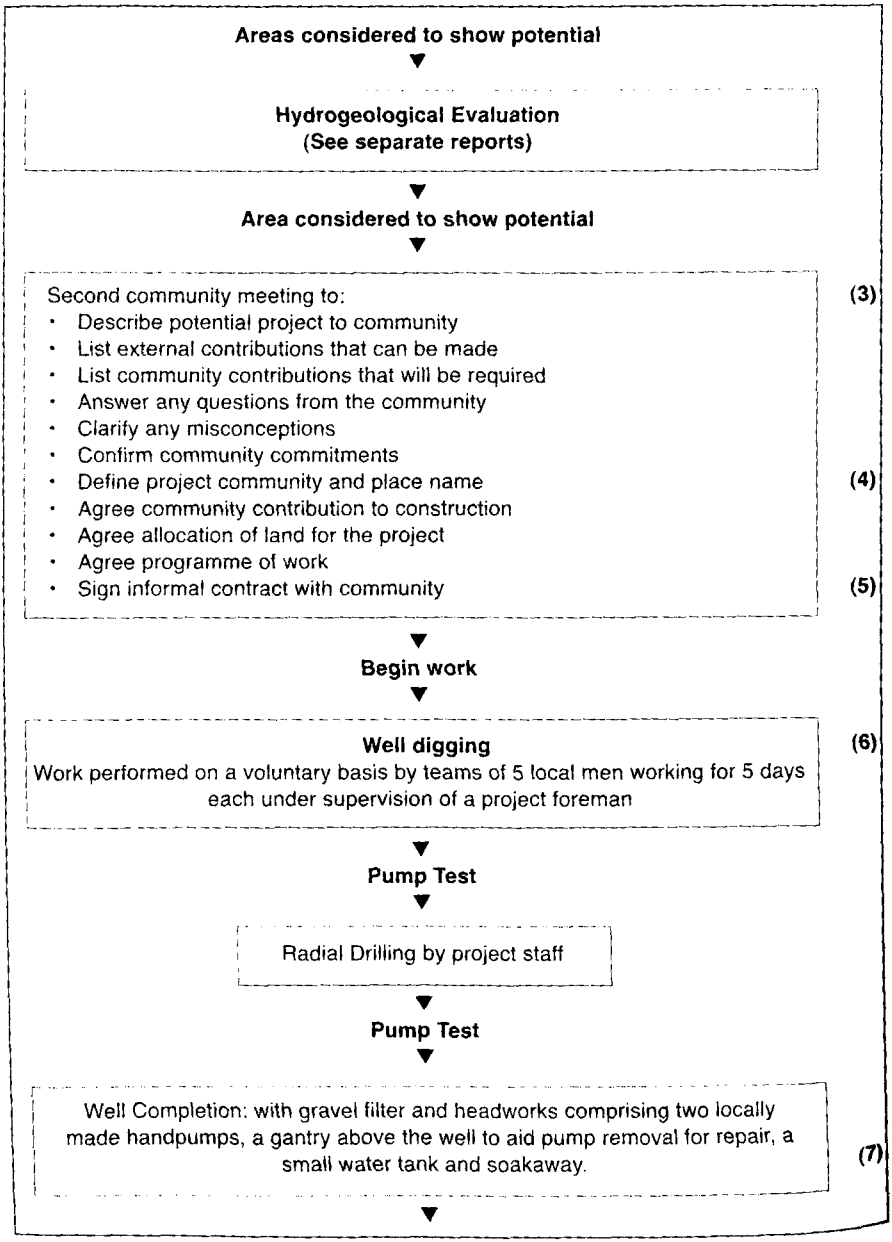
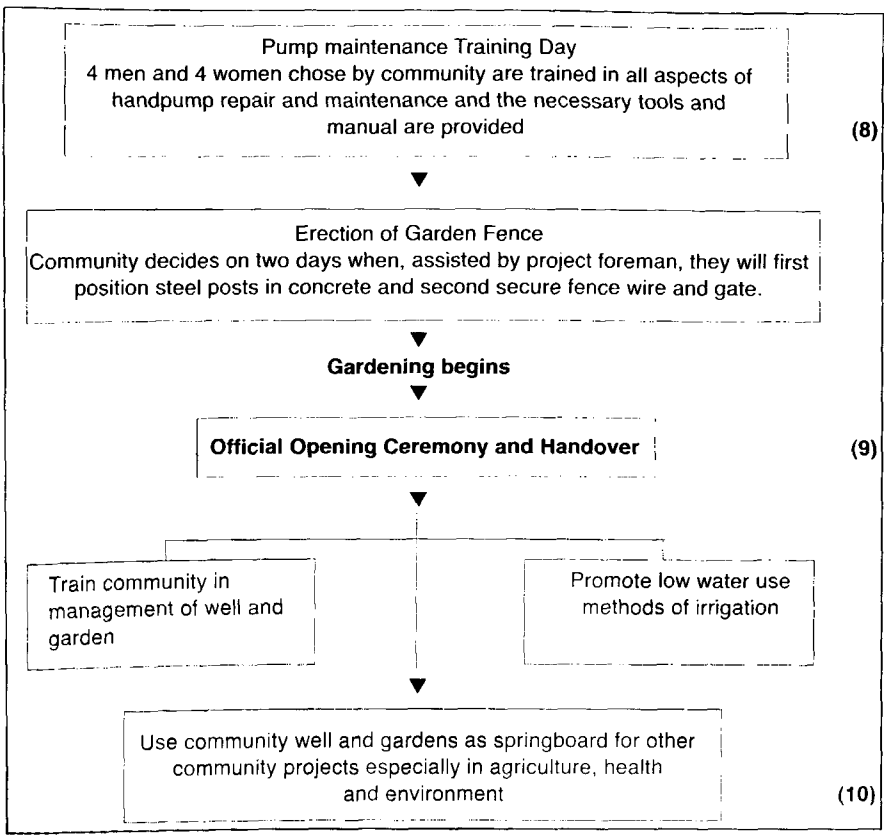


Figure 6.1 (continued)



made up of a number of villages) basis enables communities to see what is possible, be encouraged by progress at first schemes, and register their interest in the prospective project — the best way to create community sense of ownership from the outset.

Undertaking schemes on a ward-by-ward basis also allows communities to learn from each other more effectively and improves logistics of scheme construction.

(2) First Community Meeting: The importance of community meetings in this sequence cannot be overstated. They are the key to success. No work should be done in an area until local leaders have been consulted. Sufficient time must be allocated to allow these meetings to be well organised, and attended by all leaders and interested members of the community. Sufficient time must also be allowed for reflection and consideration by both community and project staff.

(3) Second Community Meeting: In southern Zimbabwe it will be rare to meet a community that does not have need for or express interest in a community well and garden particularly as this will also offer a source of clean domestic water. Thus, at the first community meeting it is important not to raise hopes too high. It should be explained from the outset that the scheme will be possible only if hydrogeological evaluation proves positive, a step described in detail by Thompson and Lovell (1995). If hydrogeological evaluation is successful, the second community meeting provides the venue for more detailed discussion to explain fully what can be possible if the community wishes, clarify any misconceptions, confirm community commitment, agree on community contributions and sign an informal community contract.

(4) Community Contributions: Sense of ownership is best achieved by maximising community contributions to the project. However, the ease with which this can be achieved and the nature of the contributions that can be made will vary depending on the type of scheme being implemented (eg. dug well or drilled borehole); the type of contribution anticipated (cost recovery, voluntary labour, food for work or paid labour); the presence of respected local leaders; the prosperity of the people and their experience of previous development projects. Generally, monetary payment for work done by local people should be avoided, whether this be payment by project staff or by other community members. In the former case, payment promotes neither sense of ownership nor good progress. In the latter case, payment causes difficulties because of the problems poor communities have in finding cash. Automatic membership of the project for those people who do work is to be preferred.

(5) Informal Community Contract: Social problems which occurred at first schemes could be linked primarily to poorly developed sense of project ownership, lack of self-confidence, problems of leadership, and misconceptions about the project regarding ownership, responsibility for management and maintenance, and distribution of benefits. An informal community contract introduced at the time of the second community meeting was found to be a potent means of outlining obligations, clarifying misconceptions, and enhancing sense of ownership. The contract was prepared in Shona. An English translation is shown in Figure 6.2. Use of the contract was well received. The people appreciated clarification which the document provided. Well construction proceeded at record pace, with all work performed on a voluntary basis and in high spirits by teams of five men working for five days each under supervision of a project foreman. Similarly, completion of the gardens was undertaken voluntarily by both male and female members as a group activity. Most importantly, there has been increased reference to project ownership noted during interviews with case study families and the incidence to date of social teething problems has been less at these sites (Murata *et al*, 1994).

Figure 6.2: Informal contract with community

Lowveld Research Stations
PO Box 97
Chiredzi

17 January 1994

To The Community:
Mushungwa & Chigarera VIDCOs
Ward 27, Zaka District

AGREEMENT FOR CONSTRUCTION, MAINTENANCE AND OWNERSHIP OF A COLLECTOR WELL AND COMMUNITY GARDEN IN YOUR AREA

Subsequent to our meeting of 6 December, in which your community expressed interest in contributing towards construction of a collector well and community garden in your home area, the following information is provided for your help and the following conditions outlined for your approval:

Ownership

- The collector well and community garden once completed will belong entirely to you the community.
- This project is designed to allow to you the community to help yourselves by allowing you to contribute to construction and subsequently to manage your own well and community garden.
- The well and community garden will belong entirely to you and not at all to visiting project staff. These people will take part only during construction, helping you create your own project. Thereafter, these people will visit only to see how things are going. Your help in providing information during these visits will be appreciated.

Construction

- During construction, project staff will provide:
  A resident foreman to supervise construction
  Materials for the well, e.g. steel lining, cement
  Digging tools, e.g. spades, picks, boots, hats
  Machinery and fuel, e.g. compressor, jack hammer, diesel
  Steel fence for a garden 75m x 75m square
  Cement for well headworks and garden fence posts
  Crushed stone filter for the well
  Two Zimbabwe 'B' type Bushpumps for the well
  Tools, rope, a manual and a gantry for pump repair
- The community should provide:
  Five strong men per day to dig the well. Working under the direction of the foreman, it is probably best if each group of five men works for six days at a time before changing to the next group of five men. Digging will take approximately 6–7 weeks to complete, depending on progress.

Figure 6.2 (*continued*)

Security for equipment left at the site. It is probably best if the community organises a night watchman.
Labour to erect the garden fence. Working under the direction of the foreman, many hands will make light work.
Collection of river sand, stones and rocks, and manufacture of bricks as required, e.g. for a small header tank. A local builder will be helpful.
Four men and four women to be trained in pump repair.

Management

- As mentioned above, all benefits from the well and garden once completed will belong entirely to you the community.
- As the sole owners of the project you will be responsible for all decisions regarding management.
- Most importantly, as the sole beneficiaries of the project, you will also be responsible for all upkeep, maintenance and repair that will be necessary for your project. This will include maintenance and repair of pumps on the well.
- Following construction and training as described above, outside staff can provide no further assistance or materials. The community should make arrangements to ensure that they can perform or pay for all necessary maintenance and repair of their project and any improvements that they might wish for in the future.

Suggestions to help start the project successfully

- Considering the above, the community should decide quite quickly who wishes to be involved and to contribute to a project as described.
- A community meeting to discuss the project might help, but efforts should be made to ensure that all interested people are informed of this meeting to allow them to attend.
- Once membership is decided, a small fee can be collected from each person (perhaps $10–$20). This money can be used by the community to form a first project fund to be used to buy seeds, sprays, etc. needed for the first cropping season.

Agreement

- If, upon reading this letter, you the community wish to contribute to the construction of a collector well and community garden in your home area as described above, you agree to provide the community contributions outlined, and you agree to be fully responsible for all management, upkeep, maintenance and repair of the project once completed, please select a representative of the community to sign below, printing also his/her name and position in the community.

Signature: .....
Name: .....
Position: .....
Date: .....

(6) Scheme Membership: The pilot project has investigated a number of different social settings. This has involved garden membership being decided by communities in a number of different ways, with resulting differences both in the performance of the schemes and in non-equitable distribution of benefits between members and non-members. These aspects are considered further by Waughray *et al* (1995). Considerable amounts of data have been collected and scheme monitoring is continuing. The consensus made by project staff at this stage is that institutional structures are still evolving and it is too early to draw conclusions on the 'best' or preferred mechanisms by which scheme membership can and should be decided.

(7) Scheme Design: In a project designed to implement relatively high yielding water points and provide rural communities with water sufficient for both domestic use and irrigation, it is vital that affordable and reliable components and sources of inputs are used in scheme design. Choice of pump type and pump maintenance thus become two key issues. In Zimbabwe, a locally manufactured type 'B' bushpump has proved to be robust and can be repaired at relatively low cost. Two have been fitted per collector well. In addition to meeting the total pumping capacity required of 15 m^3/day, fitting two pumps has provided a safety net in the event of one pump breaking down. Use of a motorised pump is not advisable. It has higher running costs and difficulties of repair that can be beyond the means of poor rural villages. It also lacks the control against groundwater depletion inherent in the use of handpumps, an important consideration in these dry areas.

(8) Community-based Pump Maintenance: Involving local communities in all aspects of the ownership, management and maintenance of water points and community gardens must inevitably involve equipping these same communities with the necessary information and training. To promote self-reliance, communities in the pilot project were trained in pump repair. A steel gantry was fitted above each well to ease lifting of the pumps, and training days were held for 8-10 members of each community at the time of pump installation when the necessary tools and repair manual were donated. All schemes were also registered with the parastatal organization, District Development Fund (DDF) to benefit from the third tier of their maintenance system that can provide assistance in cases of emergency. Generally, this approach has worked well and its success and popularity is reflected in the continuing ability and willingness of project communities to repair not only their own pumps but also those of neighbouring communities. At one site, members have even purchased spare parts in advance of future breakdowns. However, it should be noted that daily wear and tear of even this robust type 'B' pump is considerable, the pumps do break down, and presently their heavy (almost dangerous) weight is a disincentive to community-based maintenance.

In future, several of the new lightweight "extractable" type 'B' pumps should be used if these can satisfy pumping capacity, or a Siwil pump lifter (Zanamwe and van Harderwijk, 1994) should be provided with each water point where conventional type 'B' pumps are used.

(9) Official Ownership: It has been found helpful upon completion of each scheme to hold an official opening ceremony and handover. This event can be attended by local and foreign dignitaries as appropriate. It helps to seal the sense of ownership felt by the community, it allows the community to show with pride what they have already achieved in their garden, and it is an appropriate time for a celebration.

(10) Future Development: Community participation in development of small scale irrigation using groundwater provides the ideal springboard to other community projects, especially in health, agriculture and the environment. Villagers given water in the present project are now beginning other projects that include keeping rabbits and growing fruit trees. Community workers in the area are now able to advise on nutrition at the new gardens. Agricultural extension staff and NGOs are providing advice on agronomy and garden management and are promoting low water use methods of irrigation. Perhaps most exciting is the opportunity this type of first water development project provides to initiate community-based management of resources in each small catchment considered. In this way, the people themselves become responsible for recharge to their well and for the life of their scheme, and in so doing they also begin to address the problems of environmental degradation often too daunting when considered at a larger scale.

COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT

It is sometimes said that private ownership is the only way to ensure sustainable harvesting, that communally owned resources will always end up by being destroyed, and that community-based projects will always end up by failing. This is not true, but experience shows that there are certain conditions that must be fulfilled to achieve success.

Common Property Resource Management

Group ownership and management of a resource is found in many parts of the world. Where there is no form of control over exploitation of the resource, a "tragedy of the commons" can result, in which the resource is over-exploited and mis-managed. Clarke (1994) comments that studies of these systems have found that:

— The boundaries of the re[illegible] clearly [illegible] agreed on by the group and their neighbours.
— Membership of the group has to be clearly defined and agreed upon.

— There must be a set of rules made and agreed on by the group governing the use of the resource which state what each person or family is entitled to and what is forbidden.
— There must be penalties for infringement of the rules, as well as a mechanism for enforcing these penalties.
— The members of the group must benefit directly from the resource.

Project Initiation

Local communities often need a certain amount of financial help to carry out projects. In this case, villagers have to meet their financiers and start to negotiate with them. It must be remembered that the resources of the community or group are the most influential factors in improving the quality of life. This fact can not be overemphasised. Local labour, know-how and investment contribute far more to the success of a village scheme than money coming from outside. Outside funds are only effective if they compliment village resources. Chleq and Dupriez (1988) explain:

— "Villagers believe a project is their own when they themselves have invested brain power and work in it. But a sum of money or project they get after the visit of a civil servant or a nameless expert does not involve their own brain power and labour. The money or project does not belong to the villagers, and if a project is born of that one factor, the project belongs to the money-owner, not to the villagers.
— The attitude of the villagers on such matters is often strengthened by the way the financier behaves. The financier and his experts often decide the location of the project, the way the scheme will be run, the work schedule and so on.
— Experience shows the extent to which villagers, their customary headmen, and financiers must enter into detailed, unhurried negotiations, no matter how long it takes to reach agreement.
— When he brings his money, the financier is often in a hurry, and thinks he can take decisions for the inhabitants. He gives them neither the time nor the means to think things out.
— These are the usual reasons for failed projects. Failure does not necessarily come to light in the first months, when the village is full of rejoicing over the gift it has received. Failure becomes evident when relations between villagers get strained and the structures set up to deal with disputes are unable to cope to everybody's satisfaction."

The conditions and experiences outlined above give some important clues for assisting communities to manage common property resources, and for agencies wishing to initiate community-based development projects likely to be sustainable from a social perspective. They are consistent with findings of

the pilot project and highlight two lessons from this work, in particular, that should be considered in future development:

- An inter-disciplinary project team is vital, recognising that decision making at all stages is an inter-disciplinary process;
- The team should be responsible for all key steps, but must be able to adopt a flexible responsive approach and work at speeds appropriate for each particular community.

CONCLUDING REMARKS

The quantified benefits to rural communities recorded at pilot schemes and expected at future schemes, and the far-reaching benefits of using this type of first water development project as a springboard to other community-based projects in health, agriculture and the environment, may be considered sufficient to justify pilot project replication on a wider scale. The development of community gardens using groundwater has little risk of negative consequences, while offering numerous additional positive externalities, such as improved productivity due to better nutrition and health (both to scheme members and surrounding populations), reduced demands on women's time and energy spent fetching water and in providing relish, the provision of employment and skills development at the local level, the development of community spirit and collective action, and the contribution to development of local institutional structures.

The pilot project thus gives cause for optimism. It has successfully put research into practice. It has addressed technical challenges in abstracting increased water from available basement aquifers, and overcome social challenges in developing community-based irrigation using this resource. It has identified key steps that will aid future development. An increasing number of communities and agencies are requesting to replicate pilot schemes. The challenge now is to develop capacity in Zimbabwe to do this. In particular, the challenge is to find an appropriate institutional 'home' for this type of development, either in Government or the private sector, that permits a flexible, responsive, inter-disciplinary team approach to scheme development to continue beyond the 'pilot' project and under the new constraints imposed by widescale replication in the real world.

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