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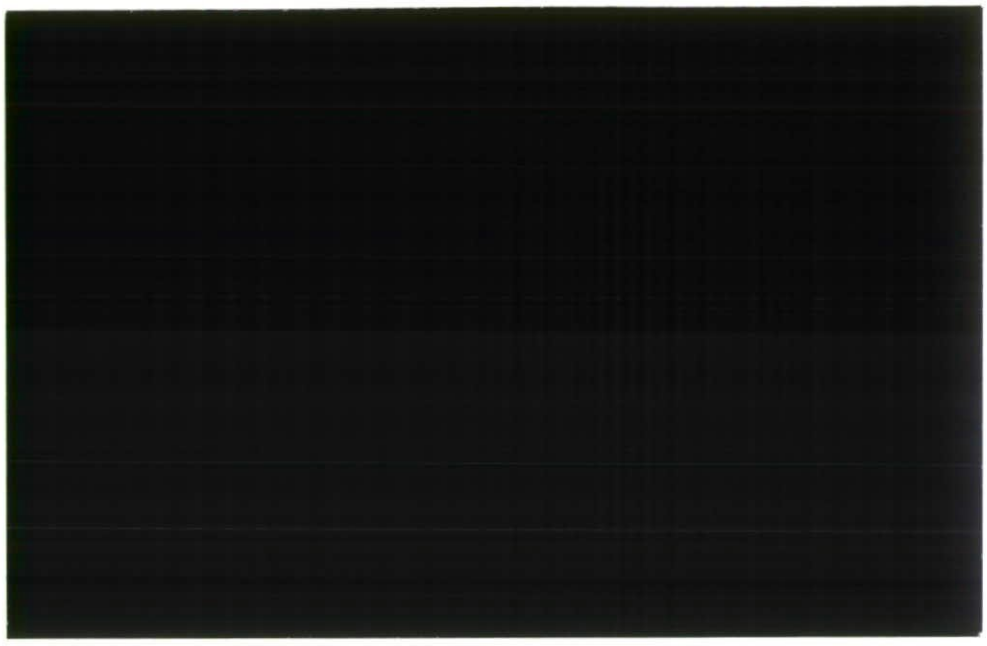

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Community Resource Management and Livelihood Strategies

CRMLS - Phase 1

Final Report

August 1996 - January 1997

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Executive Summary

Since 1983 an ODA-funded programme in southern Zimbabwe has addressed the wider objective of reducing environmental degradation and improving agricultural sustainability in semi-arid areas. Research and development projects have investigated methodologies for the development of community-managed water points and irrigated gardens, and studied the effects of land management on sustainable groundwater development.

A major component of this programme has been a pilot study in Masvingo Province (1992-1996) to assess the viability of small-scale irrigation using collector wells, undertaken by the Departments of Agritex, Research and Specialist Services, and Water Resources in collaboration with the Institute of Hydrology and the British Geological Survey. Nine schemes were completed with communities in Chivi, Zaka and Chiredzi districts. Collector wells were found to provide increased yields of groundwater for productive use in some areas. Equally important, the pilot project identified the real potential that exists to create productive water points by developing many existing, but presently under-utilised water points and by selecting appropriate more cost-effective well designs in other areas.

A second major component of work to date has been the instrumented Romwe Catchment Study of the effects of land management on groundwater recharge. Romwe is the site of the first collector well garden completed in 1991 and serves 103 families living in the valley. Physical and socio-economic data collected since inception indicate clearly the effects of current land management practices on catchment hydrology, and point to alternative practices to protect the groundwater resource and enhance productivity in this physical and social setting.

An original hypothesis of the research programme was that the introduction of a reliable water point and community based garden could help lead to wider resource management strategies within the immediate catchment. Pilot project baseline and return-to-household socio-economic surveys also began to quantify the range of benefits that reliable productive water points provided for the household and the community. Hence, the main objectives of the CRMLS Phase 1 Project were to quantify more closely the impact of productive water points on production systems and resource management strategies, and to identify future research and development needs.

CRMLS Phase I provided an opportunity to synthesise knowledge, data and observations collected over the last few years, and provided a limited (three week) period of fieldwork and several workshops. The fieldwork focused on 4 main areas, the Romwe Catchment, a pilot project collector well garden, a conventional borehole, and a small dam. The key findings were:

- Productive water points *do* have a major impact on livelihood strategies and farming systems in the surrounding area. Pilot project communities report that they have used income from their schemes to help start at least 218 household-based projects and many group-based projects. These benefit from the local community organisational structures developed in the first project, and serve both members and non-members of the original scheme.

- The new projects range from small livestock to cattle fattening, from fruit trees to buying and selling clothes, and from brick making to knitting clubs. The productive water points also lead to positive changes in the dryland farming system. Income generated from the sale of vegetables has been used to buy inputs of seed, fertilisers and labour and, for some

farmers, has allowed earlier preparation of rainfed fields and brought unused fields back into production. Although relatively small in some cases, the creation of a steady seasonal income available to a wide spread of people is proving to be important to development in an area where income is typically sporadic and unreliable.

- Productive water points differ significantly from those implemented in conventional water and sanitation projects with regards to operation and maintenance. Pumps are being maintained by garden members who use funds generated by their scheme to buy spare parts to ensure continuity of irrigation. Water user payment schemes were discussed. From this preliminary survey, it seems that at present payment for repair is made when required rather than paying a fixed rate for water *per se*. However, a higher willingness to pay for water, possibly as a monthly charge, was identified.

- Few natural resource management initiatives have occurred spontaneously with the introduction of productive water points. However, increased agricultural extension advice was reported with extension staff capitalising on the natural meeting point provided by the community garden. This, combined with the local organisational structures developed to manage the water points and gardens, appears to have increased general awareness of water resource management at these sites.

- Property rights for land, water and other natural resources, and the relationships between new organisational structures for the water point and existing traditional and modern structures, are important factors that affect successful long-term management of productive water points. In particular, the questions of resource tenure and how an intervention of this sort affects relations of power within local community organisational structures are key. This requires a closer look at social organisation and the problems of collective action in different user groups.

CRMLS Phase 1 workshop participants came from a broad spectrum, reflecting the interdisciplinary nature of the subject. They included garden committee members, village leaders, extension staff, district authorities, NGO's, national policy makers, ODA advisers, and rural development specialists. Valuable discussions were held on the experiences to date of community-based resource management in Zimbabwe, on the importance of scale (both social and physical) to natural resource management, and on the many and varied research needs and priorities in dryland areas of Zimbabwe identified from community, institutional and national perspectives. Important comments and suggestions have also been received from reviewers of the initial draft of this report. It is concluded that there is need to:

- Shift emphasis from the present extension-to-farmer approach to a more exposure-oriented transfer of appropriate technology and ideas;

- Identify the principles and local community organisational structures best suited for water resource management in Communal and Resettlement areas. This will be achieved by building on the methodology for sustainable water development started in Romwe, by selecting and instrumenting 3 - 4 additional small catchments as research foci in the other principle physical and social settings, and by nesting these within a larger river-basin or 'semi-arid' pilot catchment study;

- Investigate the potential for macro and micro economic interventions that put resources into the hands of rural communities and encourage self-initiated development. However, it is noted that this research lies outside of the scope of activities that are planned under a second phase of the CRMLS Project.

ODA is presently considering the funding of three projects to achieve sustainable development of productive water points in Zimbabwe and the region as a whole. Each of the projects has clearly defined objectives. Whilst these objectives are intended to be complementary, the CRMLS Phase II Project, in particular, has been designed so that it can stand alone and so that delays in finalising approval for other projects will not necessitate delays in starting the CRMLS Phase II Project. The three projects are:

a) *Nutrition Gardens and Groundwater Development in Zimbabwe (NGADI):* a development project to build local capacity and implement 100 productive water points (ODA TC funds);

b) *Catchment Management for Productive Water Points (CMPWP):* a development project to run parallel to NGADI to implement and assess community-based catchment management around each of the 100 NGADI productive water points (ODA TC funds);

c) *Community Resource Management and Livelihood Strategies (CRMLS Phase II):* a research project to underpin the development of productive water points, build on the findings of the Romwe Catchment Study and CRMLS Phase I and to investigate how productive water impact on the wider farming and livelihood systems (ODA TDR and NRSP funds).

ODA is concerned to support this programme in a way which is consistent with national strategies for water resource management (WRMS) and Government decentralisation (RDCCBP), and the support of ODA and other donors for these strategies through district-based integrated rural water supply and sanitation projects, small dam rehabilitation projects, and community resource management projects such as CAMPFIRE.

The research programme can and should capitalise on local experience of participatory approaches to resource development in Zimbabwe. It provides an opportunity to avoid past problems of fragmented projects developed in isolation. Equal emphasis is required on physical, institutional, financial and organisational issues of water resource management in Communal and Resettlement areas, requiring an interdisciplinary study that can draw in social science, institutional development and participatory process expertise to facilitate the project.

The potential impact of productive water points in semi-arid areas is vast, both at local and regional level. It warrants the careful design and implementation of an interdisciplinary research programme to underpin their development. The list of identified research needs is long. It is recognised that this goes beyond the remit and likely funding capacity of the ODA Natural Resources Semi-arid Production Systems Programme and Engineering Division alone. It is also recognised that the Institute of Hydrology and counterpart organisations in Zimbabwe, although taking an inter-disciplinary approach to the research programme can still benefit from the skills and experience gained from other research projects in related areas. Finally, this report indicates how the ODA TDR funded research activities could be linked to complementary ODA TC funded development activities in Zimbabwe to pursue broader and longer-term resource management objectives.

Contents

1. Introduction

1.1 BACKGROUND TO THE CRMLS PHASE 1 PROJECT

Since 1983 an ODA-funded programme has investigated ways of developing and managing groundwater resources in semi-arid areas. In Zimbabwe, this collaborative programme has involved various departments in the Ministry of Lands, Agriculture and Water Development, the Ministry of Local Government, Rural and Urban Development, the Institute of Hydrology and the British Geological Survey. Principle components of the programme have been the ODA TC- funded pilot study of "Small scale irrigation using collector wells" and the ODA TDR-funded Romwe Catchment Study. Both projects are located in Masvingo Province in south-east Zimbabwe, and are described in detail in a series of project reports (Butterworth *et al.*, 1995a,b; 1997a,b,c,d; Lovell *et al.*, 1993a,b; 1994a,b; 1995; 1996).

The main emphasis to date has been the development and monitoring of small scale, community-managed irrigated gardens using groundwater. The groundwater has been provided by a new type of well called a collector well, designed to give reliable, increased yields of water in areas underlain by crystalline basement geology. By the end of the programme 9 such schemes had been implemented, one of which, at the Romwe catchment in Chivi district, has since been at the centre of a long term investigation of the effects of land management on the groundwater resource. These nine schemes are referred to as "pilot project schemes" or "collector well gardens" in this report.

Importantly, as work proceeded in the pilot project, it became clear that the participatory approach developed to implement collector well gardens was equally well suited to any source of reliable water, ground or surface, and that real potential exists to create many productive water points, not just by using collector wells but by either developing existing water points that are presently under-utilised or by selecting the well design best suited to give adequate supply at minimum cost in other areas. The concept of "productive water points" (PWP) has evolved to encompass this shift in philosophy, and is used throughout this report to differentiate between those water points that have some form of attached production system, and those developed solely or principally for the supply of domestic water only (non-productive water points).

A research initiative entitled "Community Resource Management and Livelihood Strategies" (CRMLS) was submitted jointly to the ODA Engineering Division (ED) and Natural Resources Systems Programme (NRSP) in August 1996. It was based upon the observation that the introduction of a productive water point appeared to have good potential for production systems enhancement. The pilot study had found that the productive water points appeared to provide a good entry point for wider catchment management strategies (Lovell *et al.*, 1996) and the CRMLS research process aimed to investigate this issue further. To do so it is taking a phased approach, the first step of which, CRMLS Phase I, lasted six months from August 1996 to January 1997.

1.2 PROJECT OBJECTIVES

Pilot project baseline and return-to-household socio-economic surveys, undertaken in 1993 and 1995 respectively (Brown and Dube, 1994; Waughray *et al.*, 1995), began to quantify the range of benefits that reliable productive water points can provide, be they surface or groundwater-based, collector well or other well design. The main objective of the CRMLS Phase I project was to quantify more closely the impact of productive water points on production systems and

resource management strategies in dryland catchments, and to identify research and development priorities. Particular attention was given to determining the existence of community focused strategies that harness the economic and institutional benefits generated by productive water points. Further details are provided in Appendix 1.

1.3 PROJECT OUTPUTS

The key output of CRMLS Phase I was seen as information, specifically information on:

Existing community resource management and livelihood strategies

- current natural resource management and livelihood strategies
- the extent to which these strategies have been influenced by the introduction of productive water points

New and potential community resource management and livelihood strategies

- resource management and livelihood strategies that stakeholders feel should be implemented
- to determine if management systems are needed to co-ordinate and integrate these strategies
- to determine the best scale at which to undertake these strategies

Identify research needs to achieve development of sustainable productive water points and associated community resource management and livelihood strategies

- indicate how complementary ODA TDR and TC funded activities in Zimbabwe can be linked to pursue the broad resource management project that is required

1.4 SURVEY DESIGN AND METHODOLOGY

The CRMLS Phase I survey was designed by an interdisciplinary team comprising a Zimbabwean Social Development Adviser, two UK Farming Systems Advisers, and Institute of Hydrology and Department of Research and Specialist Services staff involved in the pilot project. In designing the survey, the team were aware of the need to take account of appropriate systems boundaries and the fieldwork thus focused on investigating the impact of productive and non-productive water points on three production systems within the surrounding catchments:

i. *livelihood systems*: current farm and non-farm based income generation and diversification activities undertaken by people living in and around the catchment;

ii. *farming systems*: decisions and actions involving land use, capital and labour inputs, crop and animal production activities, and farm outputs within the local rainfed, irrigated and livestock farming system;

iii. *natural resource management systems*: decisions and actions involving the management and development of forestry and grazing areas and surface and groundwater resources.

Although fieldwork was limited to only three weeks, it was felt worthwhile to compare (at least in a preliminary manner) the differences that might exist between productive and non-productive water points, and between surface and groundwater-based productive water points. The fieldwork thus focused on Romwe catchment and collector well garden (as the longest running pilot scheme), a second pilot project scheme at Mawadze (noted for the progressive attitude shown by the garden committee and members), a conventional borehole at Zvada Kraal

(in the same general area as Mawadze and about which nothing was known prior to the survey) and a sub-sample of four respondents in the Mawadze area who are members of a dam-based irrigation scheme at Makambe Dam. At all sites respondent households were selected randomly by drawing names from a hat containing all member and non-member households in the study area. A map showing geographical location of the sites is included at Appendix 5.

A series of informal participatory group sessions and formal household surveys were undertaken at each site during the period 14 - 25 October, 1996. The former consisted of four sessions conducted in Shona by male and female DR&SS enumerators assisted by Dr Nangati and IH staff, and took two mornings per site to complete. The four sub-groups determined by the community at each site generally consisted of older and younger men and women. Further details are provided in Appendix 1.

For the formal household surveys, each visit by the enumerators was pre-arranged to ensure that the respondent's household was aware of the survey process. The surveys were always conducted at the respondent's home and took about one hour per household.

On the 30th October, a group meeting was also held at Mashungwa Hall in Zaka District to enable committee members from all collector well gardens to meet and exchange experiences and thereby provide input to the CRMLS consultation process. Fourty-four people attended.

Overall, the three week survey provided an opportunity to:

- Update socio-economic information on the pilot project schemes
- Collect further data on household incomes
- Collect data on livelihood systems generated by productive water points
- Collect data on the impact of productive water points on the farming system
- Compare the impact of productive and non-productive water points
- Identify different water user groups at each and their institutional environment
- Analyse the willingness to pay for water at productive and non-productive water points
- Analyse the willingness to pay back a loan for a productive water point
- Investigate issues raised by non-members of gardens
- Ascertain perceived natural resource management problems and solutions

Appendix 1 provides details of how each aspect was addressed by the survey.

1.5 DATA ANALYSIS

The first step in analysing the survey data was to explore the information for distribution of responses using frequency distributions and descriptive statistics. As the samples were small, population or characteristic estimates were not calculated. Where appropriate, data was used in comparative static analyses to examine relationships between variables (particularly income levels) to see if there was evidence of significant change as a result of the productive water point. Details of formulae for statistical calculations used are given in Waughray *et al.* (1995; annex 7). The contingent valuation data was also cross tabulated and is presented with some initial financial analyses of the ability to pay for a range of potential further projects. Understandably, a large amount of qualitative data has also been processed in this project, and where not ranked is presented as a series of issues that arose in relation to a point in question. In particular, the Makambe Dam population was too small to give anything but a first glimpse.

1.6 PROJECT WORKSHOPS

The CRMLS Phase 1 project provided an opportunity to synthesise knowledge, data and observations collected in the programme over the last few years, and much of this synthesis occurred during a series of workshops and meetings.

Prior to the project, a workshop was held in Masvingo (July 24-26, 1996) to present findings of the Romwe Catchment study, discuss community-based resource management in Zimbabwe, and identify further research and development needs. This meeting addressed many issues relevant to the CRMLS project, particularly those relating to the importance of scale (physical and social) and the effects of systems boundaries on community resource management. The conclusions of this workshop are included in this report.

During the project, further meetings were held to provide other stakeholders with an opportunity to discuss the CRMLS survey results and to discuss the best direction for future research:

- A meeting on the 6-8 November was held at Triangle for district level staff. Further details are presented in Appendix 2.

- A meeting on the 11 November at the British Development Division in Central Africa, Harare, for national level stakeholders (WRMS staff, NGO's, ODA Advisers) to see and discuss the initial research findings.

- A meeting on the 9 December at IH Wallingford for UK rural development specialists and ODA managers to see and discuss the initial research findings.

Two independent consultants reports have also been produced for the CRMLS Phase 1 project. Appendix 3 provides a report by Dr Nangati, the Zimbabwean Social Development Advisor, and Appendix 6 provides a report by Prof. Keatinge, the Agricultural Systems Advisor to the project.

The following chapter presents the results of the fieldwork and consultation process in relation to assessing the impact of productive water points on surrounding production systems.

2. The impact of productive water points on surrounding production systems

2.1 UPDATED INFORMATION ON PILOT PROJECT SCHEMES

The CRMLS fieldwork surveyed 60 households. 18 were the households of garden members and 18 were the households of non-garden members at Romwe and Mawadze, 4 were members at Makambe dam co-operative garden, and 20 were households using the borehole at Zvada Kraal. 53% of the survey respondents were wives or female heads of household, 20% were male heads of household, 18% were both wife and husband, and 10% were sons and daughters. A garden member is defined as a person who has joined and remains part of the community garden at a productive water point. By way of example, there are on average 86 households with garden members per pilot project scheme, typically being drawn from five or six kraals in the area.

2.1.1 Income From the Community Gardens

Table 2.1 compares growing and selling periods and incomes from vegetable selling for garden members recorded in this survey and in the 1995 Return-to-Households Survey.

Table 2.1 Comparison of growing and selling periods and incomes from vegetable selling for garden members recorded from the 1995 and 1996 surveys.

	1995 Household Survey (1994/95 season)	1996 CRMLS Phase 1 Survey (1995/96 season)
Average length of vegetable growing season in the community garden (months)	6.8 (s.d. 2.4)*	10.8 (s.d. 2.4)
Average length of vegetable selling season from the community garden (months)	4.6 (s.d. 1.98)	6.5 (s.d. 2.7)
Average income (farm gate prices) from the community garden (Z$)**	225.20 (s.d. 99.3)	280. 30 (s.d. 100.3)

** Pilot Project 5th Progress Report (Lovell et al., 1995)*

***CRMLS Phase 1 survey Z$17 = £1; 1995 household survey Z$13 = £1 (Waughray et al., 1995)*

2.1.2 Garden member spending patterns

In the CRMLS sample, 70% of the garden members surveyed said that some of the money generated by the community garden went towards the purchase of groceries (soap, oil, salt, etc.). 65% of garden members surveyed said that some of the income from the garden also went towards school fees. 65% of garden members surveyed also said that some of the garden income went into buying more rainfed farm inputs.

2.1.3 Non garden member spending patterns

Table 2.2 overleaf compares vegetable spending patterns recorded in both the 1995 and 1996 surveys.

Table 2.2 Comparison of vegetable spending patterns from the 1995 and 1996 surveys.

	Amount spent on fresh vegetables before the garden	Amount spent on fresh vegetables recorded in 1995 Household survey	Amount spent on fresh vegetables as recorded in the 1996 CRMLS survey
Average (Z$) per month	10.41	19.60	24.00
Range (Z$) per month	5.00 - 22.00	2.00 - 30.00	10.00 - 240.00

2.1.4 Wealth and assets of garden members versus non-garden members

Data on household assets, family sizes, family members available to work in the farming system and the sizes of land holding per family were obtained during the CRMLS Phase 1 survey. Table 2.3 compares this data for garden and non-garden members.

Table 2.3 The market or farm gate price of household assets (1996) used to quantify household wealth

	Total sample	Garden members	Non garden members
Average family size/ household	11.5	11.0 *(s.d. 5.1)*	9.2 *(s.d. 4.3)*
Average number of family members per household available to work in the farm system	6.11 *(s.d. 3.86)*	7.1 *(s.d. 4.5)*	5.5 *(s.d. 3.1)*
Average size of land holding per household (ha)	3.5	3.7	2.7
Average wealth estimate of livestock assets per household (Z$)	13, 312 *(s.d. 14, 296)*	17, 711 *(s.d. 13, 195)*	9, 158 *(s.d. 14, 396)*
Average wealth estimate of capital goods per household (Z$)	10, 918* *(s.d. 26, 162)*	20, 500* *(s.d. 36, 251)*	2, 400 *(s.d. 2, 424)*
Average wealth estimate of total assets per household (Z$)	23, 624* *(s.d. 30, 313)*	46, 261 *(s.d. 51, 325)*	11, 445 *(s.d. 15, 758)*

*one outlier greater than two standard deviations from the mean removed

What is striking is that in all wealth measurements garden members, as a group, are wealthier than non-garden members. For example Table 2.4 shows that from a comparison of livestock holdings the samples are indeed statistically different.

Table 2.4 Livestock head surveyed pre and post the 1991/92 drought

Livestock	Total (and average per household) pre 1991/92 drought	Total(and average per household) in 1993.	Total (and average per household) for garden members in 1996	Total (and average per household for non-garden members in 1996
Cattle	1003 (8.4)	49 (0.4)	94 (5.5)	45 (2.5)
Goats	851 (7.1)	304 (2.5)	168 (9.8)	109 (6.0)
Sheep	79 (0.7)	15 (0.1)	-	-
Donkeys	41 (0.34)	14 (0.1)	37 (2.2)	11 (0.6)

* Data is taken at 4 prospective pilot project sites as baseline data (n= 120 households surveyed) and during the 1996 CRMLS survey (n=17 garden members; 18 non-garden members).

This is an interesting result which contradicts to some extent the findings of the 1995 return-to-household survey, which used a wealth categorisation based on reported *cash* income and enumerator observation, and found that there was no difference between the two populations. It is perhaps not surprising that the member population does not exactly reflect the wealth spread of the larger community, as it is normal that where a community is allowed to decide project-membership unhindered (as was the case in the pilot project), membership is likely to be skewed towards the wealthier and more influential members of the community. It seems that while the poor are still well represented (at least 49% of garden-members being from the very poorest sectors of the community) they may be under-represented relative to their presence in the community as a whole. The results draw attention to the skewed nature of wealth distribution in communal lands and suggest that wealth estimates based on capitalisation of assets give a more sensitive and reliable measure of real wealth than reported cash income. This methodology should be further developed in the next phase of work.

The findings also raise other important issues pertinent to the wider development of productive water points. These include the need to further investigate the question of wealth and equity when deciding project membership, and in particular to what extent outside advice is necessary or desirable to ensure access to schemes by the more marginal and disadvantaged sectors of the community. Further investigation into methodologies for judging relative and absolute wealth is also recommended, with particular emphasis on identifying a stable framework within which to monitor changes in total wealth between garden and non-garden members. Given the marked difference in family size, further investigation of the links between family size and wealth, and the effects of out migration on work-force availability are also indicated.

2.2 THE IMPACT OF PRODUCTIVE WATER POINTS ON LIVELIHOOD STRATEGIES

2.2.1 Group projects arising from productive water point income at pilot project schemes

Community discussions identified numerous examples of group initiatives that have started as a result of the productive water points. A selection of these are shown in Table 2.5 below. During discussions a number of important issues emerged. Firstly, it is clear that the *level of income* generated by the gardens (rather than the general level of economic welfare the schemes offer) is a critical variable in determining the scale and extent of related group activities, particularly those that rely on establishing credit facilities. The income potential from the gardens is in itself related to positive pre and post-harvest marketing strategies and successful collective garden management, as well as length of growing and selling periods that individuals decide upon.

Secondly, *access to information* about other GO and NGO community-based projects that require part-funding or that recognise group financial assets as a basis for offering rural development loans is important. Channels of communication between external agencies and community groups now having a small capital base have been opened and maintained at pilot schemes by village community workers (VCW's), Agritex staff and local Councillors. It is primarily through these channels that other group activities have taken off, with community money generated (at least in part) from the gardens being matched or exceeded by other agencies

Table 2.5 Case study examples of projects arising from productive water point income

* 46 out of the 50 garden members at Romwe contributed Z$920 (Z$20 each) to buy a knapsack sprayer to be used for the garden and for their rainfed cotton crops. The remainder of the $920 was used to buy spare parts for the collector well bush pumps.

* 46 out of the 50 garden members at Romwe are also members of a crochet cooperative contributing Z$2300 per season (Z$46 each) towards materials. The committee that manages the decisions and finances for this group initiative is separate to that of the garden.

* 8 member households at site 6, the most recent collector well garden, have formed a cattle fattening project. They each paid a Z$25 joining fee and contribute a monthly subscription to the club. They are hoping that their MP will help to arrange a loan for them with the CSC to purchase the cattle.

* 10 garden members at Site 1 together contributed Z$200 ($20 each) to make 10 per cent of the total cost to purchase a fence, chicks and feeding troughs with the GTZ CARD programme contributing the remaining 90 per cent of costs.

* 7 garden members at site 3 together secured a Z$15 000 loan from the AFC at a 23 per cent interest rate to buy 14 cattle for a cattle rehabilitation project. Combined with their rainfed farms, the projected income from their productive water point gave them enough credit security for the loan to be granted. The members raised an additional Z$800 each towards the purchase of the cattle. A revolving fund based on a portion of the profits from garden sales from each of the 7 members is being used to pay back the loan. It should be noted that as of 1995, garden members at site 3 earned on average Z$664 over a maximum selling period of 7.5 months. At this site, routine monitoring found that the garden members were active in finding markets for their produce, walking with dishes of vegetables for sale up to 8 km away. Block purchases of vegetables securing an assured Z$30 per day also occurred with agents coming from the nearby town of Jerera. A local school and small township also provide a ready market for the site's vegetables. Site 3 should therefore be seen as a very successful community garden in terms of income generation for its members.

* At site 2 the 109 members have used collector well water to mould bricks and income from the garden to build a house for a sewing and knitting cooperative. The Kellog Foundation is helping provide other inputs.

* 15 members at site 1 have established a poultry cooperative with materials and funds sufficient to rear 75 broilers. A rabbit unit for 20 rabbits is also under construction.

* At site 5 (Mawadze) five members each put aside Z$40 to set up a poultry cooperative. Their committee is separate from that of the garden.

* Other cooperative initiatives recorded without exact numbers of members include the planting of fruit tree orchards and gum tree woodlots, the establishment of seed nurseries, and several knitting clubs, pottery clubs and sewing clubs.

2.2.2 Revolving funds arising from productive water points

Another measure of the livelihood strategy enhancing capabilities of productive water points is the revival and blossoming of "revolving fund" arrangements among collector well garden members observed first in the 1995 Return to Household Survey (Waughray *et al.* 1995 pp.43). A revolving fund is a traditional savings club operated and managed by a group of friends or colleagues. Each member of the fund puts an equal mount into a "kitty" each week or month. The kitty is given to one member whose turn it is to spend the money. Each member takes a turn to spend the kitty - hence the name "revolving" fund. Where investment facilities are limited and where ready cash is a scarce commodity (where there is a high marginal utility attached to money) membership of a revolving fund is a rational, risk-reducing exercise. It becomes possible when members feel they can rely on a steady income from an income generating activity with which to participate in the fund.

The CRMLS survey found that 69% of garden members in the sample are involved in revolving funds based on the collector well gardens, compared to the 1995 figure of 49% of the sample. Membership of funds ranges from 7 to 20. Table 2.6 below contains details of the revolving funds formed since the collector well gardens started.

Length of selling period is critical to the amount of group savings that can be collected. Revolving funds that have longer periods over which money is collected attract more members and can afford to rely on a lower weekly contribution. Despite some gaps in information on group membership (average 11.2; s.d. 5.3), the amounts that are being collected individually by fund members in the CRMLS survey range from Z$96 to Z$240 and are sufficient to help start new individual household projects (costs quoted ranging from Z$40 to Z$440). If the funds were used to create group savings, the amounts collected would range from Z$1120 to Z$2160 per selling period (average Z$1704; s.d. 460.9) and would be sufficient to invest in the materials and inputs needed to start a group activity such as a poultry co-operative.

Table 2.6 Revolving fund information given by the CRMLS sample of garden members

SITE	Length of selling period (weeks)	Respondents ' Income from garden Z$/ year	Number in the fund	Amount put into fund Z$/ week	Total in fund per week (Z$)	Amount saved per group per season (Z$)	Amount saved per individual per season (Z$)
5	16	230	7	10	70	1120	160
5	16	240	7	15	105	1680	240
Romwe	28	180	10	5	50	1400	140
Romwe	24	325	12	7.5	90	2160	180
Romwe	12	350	20	9	180	2160	108
5	16	180	-	6	-	-	96
5	36	-	-	5	-	-	180
5	20	350	-	6	-	-	120
The following funds were clearly supported by more than just collector well garden income:							
Romwe	40	360	8	30	240	9600	1200
Romwe	52	560	16	21.6	346	17992	1124.5

Details of revolving funds established at the other pilot project sites are given by Waughray *et al.* (1995)

The type of goods on which revolving fund income is spent seems to be a dynamic variable. At Mawadze (Site 5) established in 1995, many revolving funds are being used for dealing with immediate household expenditures, such as the payment of school fees or uniforms, and the purchase of utensils and basic household needs. At the Romwe site, established in 1991, savings clubs are now geared more towards saving to buy livestock, inputs for other income generating initiatives and for "emergencies" with less emphasis on the immediate household necessities apart from the recurrent cost of school fees.

It is interesting to note in Table 2.6 the existence of two revolving funds at Romwe, the contributions to which add up to more than the estimated annual income from the garden for the individual respondents. The two respondents here were among the wealthiest in the sample and are involved in savings clubs that started as a result of the community garden, but which are now supported by incomes from other related group or individual activities.

2.2.3 Individual or household-based projects arising from the garden schemes.

14 of the 17 garden members surveyed said that the collector well gardens had helped them either start new household projects or improve existing ones. 6 said they had started two or more new projects, 5 said they had started one new project. Only 1 of these 11 was not involved in a scheme-related revolving fund. Cash inputs to start these individual projects ranged from Z$40 to Z$440 pa. Outputs from the new projects (gross margins at farm gate prices not including opportunity costs of labour) ranged from $100 to 2640 pa.

6 of the 17 garden members surveyed said they had not started any new individual projects. In an effort to identify reasons why, other socio-economic variables were investigated. Only one of this sub-sample was a member of a scheme-related revolving fund. On average this sub-sample had a longer growing period in the garden (all six grew for 12 months of the year) but sold less vegetables (an average income from the garden of Z$227.50). The sub-sample has a wide disparity in wealth, ranging from 2 owning little or no livestock or capital goods to 1 being amongst the wealthiest in the whole survey. 4 of the 6 have less than the average sample size of land holding (1.5-2.5 ha compared to the sample average of 3.5 ha). The sub-sample (less one household with 19 members working on the farm) also had an average of 5.8 people labour availability compared to an overall sample average of 8.4. It is not known whether these 6 respondents are members of some of the new *group* projects at these sites.

From this limited sample there does not seem to be a single overriding factor that constrains garden members from starting new *individual* projects on the back of the benefits a productive water point provides. Issues such as land, capital and labour availability may well interact with other factors such as security of tenure, soil fertility, other projects (for the wealthier members) and other priorities of the household decision making process not investigated in this preliminary survey. The different types of individual project reported by committee members to have started as a result of income generated at pilot schemes are shown in Tables 2.7. and 2.8.

Table 2.7 Farm-based household projects started using income from productive water points

	Number of projects
Goat projects	21
Poultry projects	19
Fruit tree projects*	16
Turkey projects	15
Cattle fattening projects	11
Rabbit projects	5
Gum tree woodlots	3
Pig projects	1

*at site 5 most members (48) now have an individual fruit tree project as a result of the collector well garden

Table 2.8 Non-farm based household projects started using income from the collector well gardens

	Number of projects
Buying and selling 2nd hand clothes	28
Household knitting projects	12
Household pottery projects	12
Household mat-making projects	9
Household sewing projects	9

Although one household may undertake more than one project simultaneously, in total **218** different household based projects were reported to have started at least in part as a result of the collector well and community garden schemes.

The schemes seem to be especially good at enabling female garden members to move into alternative income generating activities. However, none of the projects appeared to specifically benefit or be targeted at young men or young women in the community. In fact, the younger people at the project sites (both school leaving age and the newly married) stated that no real income generating opportunities have arisen for them from the collector well and community garden. This is despite the fact that younger people believe that they often do most of the work in the garden with little or no recognition from their parents.

Sentiments of alienation expressed by some younger people are an issue also identified in previous work. It is however necessary to differentiate between complaints expressed by young school age members of garden member families and young married couples. Complaints by teenagers about having to work on the family plot without receiving payment should be viewed within the context of a growing generation gap between elders who expect family members to work together for the common good, and younger people who tend to think in terms of cash wages and wish to be more independent. Given that one of the most reported uses of project money is payment of school fees, their complaints should perhaps be given less focus.

The case of young couples is however worthy of closer attention. Many young people leave the communal areas to search for work in urban areas, those who remain or return very often have inadequate access to land, which is largely tied up by the elders. Traditional systems of land management are based on the assumption that there will always be adequate supplies of new land to which family members may move, something which is obviously no longer the case.

The young poor, while not specifically identified within this survey, are a very real sub-group, and earlier work has identified them as being particularly interested in those wealth generating projects where access to land is not a prerequisite. The extent to which this group is represented in collector well gardens, and the potential for further projects to specifically target them, should be an area of priority in further research.

2.2.4 Changes in the livelihood strategies of non-garden members

6 of the 18 non-garden members surveyed said they have also started new projects or are involved in new activities as a result of the collector well gardens. These include:

- the buying and reselling of vegetables from the gardens. For example, at Romwe a non-garden member described how she would buy 13 bundles of vegetables at the garden for Z$1 per bundle and then re-sell them in the nearby township for Z$2 per bundle. Visual evidence in the townships in Masvingo Province suggests that particularly vigorous markets for fresh vegetables exist at certain times of the year. Need for further research on crop rotations and marketing strategies to capitalise on this market was identified during the pilot project and proposed for the next phase of work.

- being hired for labour (weeding, planting, harvesting) in the community garden or in garden members' rainfed fields

- beer brewing and brick making using water from the collector well. Non-garden members said, however, that water related production activities such as these occur only at those sites where there is perceived to be enough "spare" water from the water point after the community's domestic and garden irrigation requirements have been met.

- The above are all household-based activities. The CRMLS survey did not identify any group-based non-garden member initiatives that had started as a result of the productive water points.

2.3 THE IMPACT OF PRODUCTIVE WATER POINTS ON SURROUNDING FARMING SYSTEMS

2.3.1 The impact for garden members

14 of the 17 garden members surveyed said that they had experienced positive changes in their farming practices as a result of the collector well garden schemes, mainly through the ability to purchase more farm inputs to improve productivity.

In the sub-sample of 3 garden members who had not changed their farming practices, all had a below average number of household members working on the farm. In addition, all were below the sample average in wealth, and 2 of the 3 had less land than the sample average; one of these respondents was one of the poorest in the whole survey. 2 of the 3 are also from households that have not undertaken any new individual income generating projects. It would be useful to monitor this more closely over time, to see if the schemes do, in the longer term, benefit these most resource poor households as they have (in more rapid fashion) those households with more labour, land or capital assets. Other socio-economic factors such as education and health may also be important here. However, when considering issues of equity, it should be noted that these resource poor households are still members of the community garden and, as such, are benefiting from access to a reliable source of fresh vegetables and cash income.

When asked exactly how they have changed their rainfed farming practices, garden members in the sample gave a range of responses:

Seed Purchases
11 of the 17 members said they use garden income to buy seed for their farms. Planting times are particularly critical in dryland farming, and the importance of being able to rely on an income (however small) at planting time cannot be over stated.

Hired Labour
Shared and hired labour has always been a feature of farming in communal areas of Zimbabwe. In recent years, however, there has been a shift away from traditional arrangements of reciprocity (work parties etc.) and payment in kind (typically beer and meat) towards more commercial relationships. In Romwe, wealthier families frequently employ younger members of poorer families to do chores such as herding and cleaning, often while their own children are at school.

7 of 17 garden members surveyed said that they use money from the scheme to help hire labour for weeding, maintaining contour bunds, spraying and ploughing their rainfed fields. It is typically younger, poorer members of the community who are keen to be hired for work, and the survey suggests that they appreciate the availability of cash to pay for their work that is provided by the collector well garden. Several garden members said that they hire children to weed their collector well garden plots at Z$10-20 a time. Several non-member families said that this income from their children's labour is now an important part of the household budget. The long term effects on the children of poorer households who miss school to earn money was outside the scope of this survey, but this whole area is of crucial importance when considering the equity of the development process as a whole.

The CRMLS survey suggests that labour budgets have been *enhanced* in the rainfed fields as a result of the collector wells and community gardens. In general, garden members' rainfed farms are now experiencing more labour inputs from hired labour to weed and spray and to help prepare the fields. A typical response from a garden member was that: "I used to leave two hectares or so of my farm each year, but now I can farm it all by hiring labour."

Purchase of inorganic fertiliser
2 members in the sample said they use garden income to buy inorganic fertiliser for their rainfed fields. The respondents were not particularly wealthy, although they were gaining an income from the collector well garden greater than the sample average. Both had land holdings less than the sample average.

Purchase of other farm inputs
7 of the 17 members surveyed reported that garden income also helps in the purchase of other rainfed farm inputs, namely chemicals, hoes and replacement parts for ploughs and cultivators such as nuts, bolts, blades, buckles etc. Of this sub-sample, 6 of the 7 also said they hired labour and bought more seeds, and 1 bought fertiliser.

Cropping Patterns
Evidence of a change in cropping patterns came from members interviewed at Mawadze, where some rainfed vegetable gardens have been converted to fruit orchards. At this site, vegetable supply is now perceived to be met by the community garden, and tree nurseries funded by the community garden can supply member households with trees to provide fruit both for home consumption and for sale.

Agricultural Extension Advice

All garden members surveyed were unanimous that extension advice has improved as a result of the collector well garden. Respondents said that previously the extension worker used to visit the better farmers but now makes more regular visits and more group talks on farming methods. Respondents also reported that the extension staff use the community gardens as a regular meeting point for the farming community, talking to the members as a group on what their targets and focus should be for a particular farming period, be it in the community garden or in the rainfed fields. Similarly, the community now lobby the extension staff collectively for advice and feedback on common problems. Two sites drew attention to problems they were having with their extension worker and the need for quality advice to help improve the productivity of their farming systems.

All sites reported a problem with poor vegetable quality. Reasons put forward included infected compost, lack of rotation, and incorrect pesticides. These problems were consistently recorded during the pilot project, and CRMLS confirms the real need for more research and extension on aspects such as permaculture, pest and disease control, crop diversification and crop rotations that consider markets, taste preference, and the limited number of beds available per member.

2.3.2 The impact for non-garden members

The ability to purchase more inputs for the farming system was found to be almost exclusive to garden member households. However, 15 of the 18 non-garden members surveyed said that they have also experienced some improvement in farming as a result of the productive water point. Indirect benefits were said to include better extension advice as a result of attending and contributing to the group talks now held regularly at the gardens. The survey also found that non-garden members have reacted positively to the experience of watching the community gardens evolve. Non-garden members mentioned that they have seen how, if people work together, they can be assured of getting something, even if the area of activity seems relatively small at first. At Mawadze a farming group has now been formed by both non-garden and garden members in order to visit one another's fields and share ideas on farming techniques.

Importantly, the CRMLS Phase 1 survey suggests that the non-garden members' private rainfed vegetable gardens have not been affected by the new community gardens. 15 of the 18 non-garden members surveyed said that they still use their rainfed gardens for growing vegetables for home consumption during the wet season. 14 said that they still grow some rainfed vegetables in their fields during the wet season.

2.4 OTHER ISSUES RAISED BY NON-MEMBERS

Table 2.9 shows the benefits to garden members of the water point schemes as ranked by the non garden members. The key benefit that non-members felt accrues exclusively to members was that of direct access to fresh vegetables, particularly during the dry season. The benefits of a reliable water source were not felt to be exclusive, however, as non-garden members have access to the water points for their domestic water requirements. When asked to identify income generation opportunities that the schemes had created for members, non-members commented that the schemes had allowed members to buy livestock and inputs necessary for rearing them, to purchase household needs, to be in revolving funds, and to be able to buy food even in drought periods.

Table 2.9 The benefits to garden members as ranked by non-garden members

Benefit in order of importance	% of non-garden members who ranked the benefit at this level of importance
1. More fresh vegetables	77
2. "Other things"	72
3. More money	44
4. Reliable water supply	22

The category "other things" includes the wide range of non-member's observations about the advantages members have obtained as a result of the productive water point. For example, some non-members added to the improvements in farm productivity by saying that, in being able to sell fresh vegetables earlier than others in the community, members of the garden can now buy seeds and start rainfed farming earlier in the season than others. In many seasons, garden members rainfed yields will thus be higher (a benefit of early planting) and earlier harvests can also be sold at a premium. Other non-members highlighted the "benefit" to the garden committees of the money now being collected as charges for water use.

2.5 THE IMPACT OF PRODUCTIVE WATER POINTS ON NATURAL RESOURCE MANAGEMENT

A shortage of grazing land, overgrazing of existing pastures, tree felling, and the opening up of new, marginal land were the main natural resource management problems identified by the sample groups. Initially, little weight was given by the groups to a perceived need for water resource conservation or for ideas for improved management of water resources. However, the groups in general seemed to be responsive to issues of conservation when these were raised, perhaps as a result of the increased level of extension advice at these sites. Indeed, one respondent at Romwe has dug her own infiltration pits, and the extension worker at Mawadze is encouraging the community there to do the same thing around their collector well.

From the group discussions, it appears there are a variety of ways in which natural resource management activities are implemented, whether initiated by individuals, extension staff or traditional leaders. Generally, work is undertaken through the extension services, who turn to the kraal heads to either mobilise people in the community and or to enforce penalties on wrongdoers, usually through the imposition of fines. To implement a fining system, the kraal head often uses a traditional enforcement agency in the form of a 'natural resources' committee within the community. These kraal-head committees can be for land and trees and grazing. Sometimes there is an overlap, with members of a productive water point committee also serving on a kraal head NR committee. Although these committees cover all natural resources in the area, there was general dissatisfaction expressed by the sample groups on the ability of this system to effectively deal with the natural resource problems that are occurring.

The CRMLS survey obtained far less evidence for either community-based or household-based natural resource management initiatives resulting from the productive water points, than say for the proliferation of income generating activities and farm productivity enhancements.

2.6 PRODUCTIVITY AROUND OTHER WATER POINTS

2.6.1 Livelihood and farming systems at a conventional borehole site (Zvada kraal)

At Zvada Kraal, the location of a conventional borehole about which nothing was known prior to the survey, 10 of the 20 respondents interviewed reported that they are involved in community vegetable gardens, either at Makambe dam or on the banks of the Chiredzi river. Both locations are 3 to 4 km away. 4 respondents have a private garden at the Chiredzi river. These 14 households grow vegetables for an average 6.6 months/ year (s.d. 4.5), with 11 selling some of their produce for an average 3.4 months/ year (s.d. 3.4). Discounting one outlier, the average income earned from these gardens is Z$160.7 pa (s.d. 99.5)

Of the 11 who sell some vegetables, 8 spend part of the income on groceries; 4 also spend part on supporting school fees; and 2 spend part on buying inputs for the rainfed farm. 4 are also members of a revolving fund as a result of being co-operative garden members. The average number of members of these clubs is 9, and money is used to buy household utensils. Due to the 1991/92 drought which placed severe stress on the gardening co-operatives, several other savings clubs have collapsed. Details of revolving funds at the conventional borehole are presented in Table 2.10 and may be compared with the figures for the collector well garden members.

Table 2.10 Revolving funds at Zvada Kraal conventional borehole for those who are members of a co-operative vegetable garden

Length of selling period (weeks)	Respondents' annual income from garden (Z$)	Number of members in fund	Amount put into fund (Z$/week)	Total in fund (Z$/week)	Amount saved per group per season (Z$)	Amount saved per member per season (Z$)
16	320	10	2.50	25.00	400	40
16	?	7	12.50	87.50	1400	200
32	120	5	12.50	62.50	2000	400
16	160	10	2.50	25.00	400	40

7 of the 20 respondents said they relied on their rainfed fields for vegetables during the wet season, and 8 said they bought vegetables from other gardens (either co-operative or private gardens) during the dry season. Those who buy vegetables during the dry season do so for an average 3.1 months (s.d. 1.1) (September, October, November being the most commonly cited months). These households spend on average Z$54.9 on fresh vegetables during this period (s.d. 33.7), within a range Z$16 to Z$100.

The survey identified only one group project - a poultry initiative - which was said to have been started as a result of the vegetable gardens at Makambe Dam and Chiredzi river (not at the borehole). Household-based income generating activities that have started as a direct result of the borehole include two poultry projects, three beer brewing projects, and one brick- making project, although these people are generally told to use the dirtier water from the river for brick making. Respondents in the survey stated that these household-based projects mostly coincide with the need to pay school fees. 3 of the 20 respondents now brew beer using the borehole water. Together with the one household now making bricks, the average output (gross margin) from these activities, not including opportunity costs of labour, is Z$949 pa (s.d. 884.3).

Although there was a noticeable lack of group or community based activities in the area, there were plenty of income generating *ideas* for group activities. A range of group projects had been designed and submitted to the village community worker. These included, poultry, fruit and gum trees, sewing and rabbitry initiatives. One cattle rehabilitation project has been saving funds since 1993. Most of the group project ideas involve small numbers (less than 8 members) and are kraal-based. However, few (if any) of these activities have successfully taken off. 18 of the 20 respondents said they wanted to start new projects. Of these, 13 said a lack of money was the key constraint. When this point was explored further, the respondents said that the main constraint to initiating and sustaining group ideas was the problem of *unequal* cash distribution within the community. In essence, money is never with enough people at the same time to allow group projects to take off. 7 of the 20 respondents said a lack of a water was also a major constraint. Vegetable gardens and a new water point were the main desire as a group. Vegetable production was seen as a lucrative income generating project with the additional benefit of fresh vegetables for the household. Table 2.11 overleaf shows priorities for new group projects at Zvada Kraal. Desirability is ranked on a scale of 1 to 5, 1 being most desirable.

Table 2.11 Priorities for new group projects at Zvada Kraal conventional borehole

Type of Project	AS RANKED BY			
	Older Women	Older Men	Younger Women	Younger Men
A productive water point and associated garden	1	1	1	1
Cattle fattening	2			2
Cattle re-stocking		2		
Goat rearing		4		
Pig co-operative	5			
Poultry co-operative	3	5	4	
Orchard and gum trees	4	3		
Sewing co-operative			2	
Crochet co-operative			3	
Soap making co-operative			5	
Knitting co-operative				3
Carpentry				4
Fish Pond				5

None of the sample hire labour to work on their rainfed farms. Only one buys fertiliser. No mention was made of any other improvements to the farming systems resulting from the borehole.

2.6.2 Livelihood and farming systems at a dam site, Makambe dam

It should be emphasised at this point that the sample of 4 people interviewed at Makambe dam is sufficient to give only a most general indication of areas of interest for further investigation. Makambe dam is the source of water for many communal vegetable gardens. 4 randomly selected members of a 131 member garden were interviewed. The respondents had between 5 and 17 beds in the garden, grew vegetables for an average 10.75 months per year (range 9 - 12) and sold some of the produce for an average of 6 months. They reported difficulties in selling because so much produce is being grown (a problem also highlighted during the pilot project).

Their average income from vegetable sales is Z$421 per year (range Z$105 - Z$800) and is spent on groceries, supporting school fees and for 3/4 respondents for buying more seed for the rainfed farm. 2/4 respondents were members of a revolving fund. Annual savings per member were Z$280 and Z$480 with the clubs having 9 and 5 members respectively. One respondent said there are many savings clubs operating in the dam site gardens.

One group poultry project was identified by one respondent to have started as a result of the dam garden. However, she said she'd like her own poultry project as she doesn't like working with others from the dam site. All 4 said they'd like to do more projects but lack of money was the key constraint. In terms of their rainfed farms, 2 of the 4 respondents hire labour for their farms, 3/4 buy seeds using income from the dam garden, and 1 buys fertiliser. They all agreed that their exposure to agricultural extension advice had improved since joining the dam garden. They said they now met often with the agricultural extension officer for advice on their garden.

2.7 SUMMARY OF FINDINGS

- Vegetable growing and selling periods from the CRMLS Phase 1 sample of collector well garden members have increased compared to the 1995 return-to-household survey. Average annual incomes from the gardens are now Z$280.3 per member (sd 100.3; range Z$150 to Z$1 080).

- A statistically significant difference in wealth was found between samples of garden members and non-members. This was based on a monetary valuation of assets.

- Productive water points do have a positive impact on the number of group activities subsequently undertaken. Two factors were found to be important to this process: (i) the income that the productive water point generates, and (ii) community access to information about other appropriate new projects.

- Respondents identified 218 household-based projects that the productive water points had helped garden members to start, principally small livestock income generating projects. There was no overriding factor that constrained members from starting such projects. One third of non-members sampled said they were also involved to some extent in new activities as a result of the productive water points. Many of the new projects are led by women, but none seemed to specifically target younger or newly married members of the community.

- Revolving funds play an important part in capitalising on the potential of productive water points. The majority of garden members sampled make use of a revolving fund to access significant sums of money at regular intervals. These funds appear to evolve over time to meet new spending or savings requirements of the groups.

- Non-members said they have also experienced some positive changes to their farming system as a result of the productive water points, principally through receiving increased extension advice and receiving cash payment for work as hired labour that allows purchase of farm inputs. The more resource poor member households did not report such improvements, but still benefit from the supply of vegetables and cash generated by their plots in the gardens.

- People interviewed at group gardens at Makambe dam had a comparable income to members of collector well gardens. Investments in the farming system were also similar but preliminary indications are that fewer new group or household projects are started.

- Few natural resource management initiatives have occurred spontaneously as a result of the productive water points. However, establishment of water and garden committees,

combined with increased extension advice, had increased general awareness of conservation issues at these sites. A shortage of grazing land, overgrazing of existing land, tree felling, and opening up of marginal lands were the main natural resource management problems reported.

- A conventional borehole, implemented without emphasis on production but principally for domestic use, has not had significant impact on surrounding production systems, despite the water point proving to be reliable and many ideas existing for group projects. A lack of cash and unequal distribution of cash are key constraints to starting new projects if productive potential of a water point is not developed at the time of installation.

3. Institutional and Financial Sustainability of Productive Water Points and Associated Projects

3.1 LOCAL COMMUNITY ORGANISATIONAL STRUCTURES AND ADMINISTRATIVE BOUNDARIES

The following is a brief description of the institutional environment in which productive water points are being implemented and managed in Zimbabwe. It is critical to consider this area if discussions of the findings of the CRMLS survey and future research needs are to be undertaken in a realistic context

The country is divided into 5 administrative Provinces, each subdivided into a number of Districts, with each District having an elected Rural District Council (RDC) consisting of Councillors from individual Wards. As part of a policy of decentralisation, ODA and other donors are currently supporting a national Rural District Council Capacity Building Programme (RDCCBP). Development issues in each Ward are co-ordinated by a Ward Development Committee (WADCO). The smallest administrative unit recognised by these government planing authorities is the Village, administered by the Village Development Committee (VIDCO) and consisting of elected representatives from several Kraals. Capacity building at this local level is also occurring in Zimbabwe, in programmes such as the Communal Areas Management Programme For Indigenous Resources (CAMPFIRE).

The Kraal is generally acknowledged as the unit with which rural people are most comfortable. In Communal Areas, each Kraal is led by a traditional Kraal-Head or Sabhuku. The Sabhuku is the lowest level of the traditional hierarchy, having a pyramid of Headmen (Ishe), Sub-Chiefs, Chiefs and Paramount Chiefs above him. In Resettlement Areas, land bought by the government from the commercial sector and used to resettle targeted sections of the population, administrative arrangements are similar to Communal Areas but without the traditional hierarchy (although the latest development in Resettlement Areas is to re-instate the role of Sabhuku).

While the Kraal is universally recognised, it is not an administrative unit. The overlapping and sometimes contradictory powers of traditional and government systems has been a perennial subject for discussion at workshops dealing with land issues in Zimbabwe. Appendix * lists some of the key finding and recommendations of the recent Zimbabwe Land Tenure Commission. Some confusion is caused by interchanging the terms Village and Kraal. Throughout this report, Kraal is used to designate a collection of households under the traditional authority of a Sabhuku, and Village is used to refer to the smallest administrative unit recognised by the government.

3.2 DIFFERENT USERS OF PRODUCTIVE WATER POINTS AND THEIR DIFFERENT DEMANDS

3.2.1 Different user groups

The CRMLS Phase 1 survey identified different user groups at each water point who apply pressure for their own production systems enhancement. Where a group-based project is attached to a water point to utilise its productive potential, it appears that the community may be

split into three key user groups and possibly a number of others, depending on the site. These user groups are shown below.

Group 1 : Project members

Members of the initial project, who use the well water for domestic purposes and for their productive venture. Group 1 people at the collector well schemes are the garden members. It is members of this group who have formed a committee to manage the water point and garden project. Because of the way these schemes were implemented, this group is made up of representatives from several kraals. With the garden as their common interest, they are able to focus and lobby their interests effectively through their committee. This can be seen by the improvement in extension advice at each site. With the appointment of a chairperson, secretary and treasurer, these groups usually contain key members of the community having experience in village level administration.

Group 2 : Project non-members

Non-members of the initial project but who use the water point for some or all of their domestic water and sometimes for other productive activities. Group 2 people in the collector well schemes are the non-garden members. At these schemes, garden committee members thought this group consisted of an average of 71 households per site. However, this group does fluctuate and is hard to delineate because some people use other water sources as well. Group 2 water users at pilot project sites have much less of a coherent focus or lobbying power than Group 1. Viewpoints are expressed either "as and when" by prominent individuals or through non-participation in the repair and maintenance of the water point. Pressure exists within Group 2 from people who now wish to join the productive scheme but who initially were either absent, unable to join, or risk-shy.

Group 3 : Seasonal users

Those who use the water point on a seasonal basis, particularly in times of general water shortage. Experience from the pilot project suggests that Group 3 water users consist of those households who do not have a reliable water point closer than the collector wells and who create extra demand as other water sources fail. This group were not explicitly surveyed in CRMLS but the lack of any mention of them by other users indicates that their lobbying power is weak and that they currently play little part in the management of the water points. It appears that Group 3 users are rarely considered in current water and sanitation projects.

Other Groups

Depending on the particular location of the water point, other user groups can include schools, businesses and individual entrepreneurs. At one pilot scheme, for example, a local school teaches brick-making using water from the well. Such groups can exert significant lobbying power and affect committee decisions.

3.2.2 Different Demands

The different water user groups operate at different spatial and temporal scales. Group 1 is clearly focused on their garden and its affect on their farming systems and livelihood strategies, thinking further ahead as income security increases as a result of the scheme. Groups 2 and 3 are focused more on the immediate supply of water and independent livelihood strategies, with less incentive to consider long term management issues at the productive water point.

Demand to initiate or expand group and individual projects at the productive water points is increasing with time. Differences between the various user groups, with conflicting interests and incentives, is also increasing and is creating more strain on the productive water point committees' attempts to sustain co-operative management strategies. The demand for new uses of the water come from individuals in both groups 1 and 2 and pose difficult questions for the water point committee: Which projects should be allowed? Should there be a bias towards one group or another? Should new projects be for groups or individuals? How will the different projects be managed? Will there be clashes of interest? How will O&M of the water point now be organised? How sustainable will the final combination be?

Field evidence suggests that these issues can become a source of conflict in managing productive water points. The survey noted problems surfacing where garden members now complain that non-members take water for other activities (brewing, brick making), misuse or overwork pumps, and contribute little money or labour to scheme maintenance. Group 3 water users were not mentioned in this survey but previous fieldwork has recorded a flat-rate disincentive charge being levied against seasonal users to discourage them in times of water shortage, and even cases of people being barred from using a water point because "they come from too far away". The importance of conflict management in community projects is discussed further in Appendix 3.

3.3 INSTITUTIONAL SUSTAINABILITY OF PRODUCTIVE WATER POINTS

Four issues central to the institutional sustainability of productive water points and their related activities emerged from the CRMLS survey:

1. The implementation procedure used to set up the initial scheme
2. Local property rights to land, water and other natural resources
3. Management structures around the productive water point
4. The size, diversity and membership of associated projects

3.3.1 The implementation procedure used to set up the initial scheme.

Implementation of community-based development initiatives is not easy, and many factors can influence 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 productive water point if they know that it belongs to them and not to another agency. An important corollary of this is that the community is involved at all stages of the resource development. In the pilot project an interdisciplinary team was found to be vital to this process, as decision-making at all stages is an interdisciplinary process. Valuable lessons learnt at the first schemes allowed key steps to be identified that help to promote community involvement and ensure productive water points more likely to be sustainable from a social perspective (Lovell *et al.*, 1996).

The CRMLS Phase 1 survey confirmed the importance of this initial implementation process. At schemes completed early in the pilot project, when members were paid to dig the well shaft, the survey identified tensions between garden members and non-members on payment for repairs to the water point. The implementation procedure left a water point for which only a few were deemed responsible. In contrast, at later sites where a social contract helped to clarify responsibilities and create a wider sense of ownership, where volunteer labour was used, and where the scheme was formally handed over to the whole community, problems of this nature were much less apparent.

3.3.2 Local property rights to land, water and other natural resources

Land allocation for productive water points and their associated community projects was identified as a problem at some sites during the pilot project (Lovell *et al.*, 1996). The CRMLS survey has provided more detail. Conflict has arisen, for example, where an influential person is the "owner" of the land (and the groundwater) on which the productive water point and community project is located, and these persons are exerting considerable influence on (if not over-riding) the garden committees' decisions particularly regarding right of access for users in Groups 2 and 3. Similar problems were also apparent at the conventional borehole site. Here, groups from outside Zvada kraal were physically barred from using the water point.

The problem of who has the right to "own" the natural resource is compounded when this resource is utilised to generate income and when additional projects start to appear (see also Appendix 3). Participants at the district level workshop confirmed that such problems are commonplace in projects which attempt to implement community-based resource management strategies like productive water points that require a tract of land to be utilised by the project.

Tenure in the communal lands presents something of a paradox. On paper it is clear that the government owns all the so-called communal lands. On the ground however the situation is often reversed, with real power over land allocation frequently being wielded by traditional leaders. Attempts by government operatives to intervene are frequently ineffectual and issues of squatting, illegal cultivation, illegal land clearance and so on are frequently reported in the national papers. A major review of this sensitive question has recently been undertaken by the Land Tenure Commission. A synopsis of the findings and recommendations presented by Dr Nangati during a CRMLS workshop is given at Appendix 4. There is a clear need for further research on this aspect, although the situation is likely to remain difficult until new government policy is defined. The consensus from stakeholders at all levels is that, in the meantime, community-based projects have to find the right balance between working with formal and informal institutions and that it is vital that all institutions are consulted during the development.

3.3.3 Management structures around the productive water point

The survey found that some group projects connected to a productive water point have set up separate committees to that of the initial community garden committee. This creates management problems for the water point and conflict of interests. Examples were provided by groups trying to make decisions about investing in fruit tree and seed nursery projects while the water resource they ultimately rely upon is controlled by the garden committee.

The need is clear for any new production initiative to clarify and formalise its relationship with the existing productive water point committees and the traditional and political institutions operating within the community that include kraal-heads, kraal-based grazing and woodland management committees, the VCW, the VIDCO, the WADCO, the NRB and Agritex. The

CRMLS survey confirmed that these institutions play an important role in advising and supporting members of productive water point projects and also help in identifying matching-fund type schemes and credit facilities to start new projects. Any expansion of production and natural resource management systems within the area should therefore actively encourage the involvement of these institutions.

3.3.4 The size, diversity and membership of associated projects

The survey found that problems can arise between users of productive water points regarding the size and diversity of new projects that should be developed, and who should be members.

At Zvada Kraal, for example, there was demand for several small gardens at the borehole to serve different groups in the community, whereas at pilot schemes there was demand for second large gardens or expansion of the first gardens to fit everyone in. All group discussions contended the range or size of group projects that could be initiated. A second critical issue was whether initiatives conceived by non-garden members (Group 2) can be developed around the water point. This was an area of concern identified by regional and national decision makers and by non-garden members alike. It rests on whether or not further development around the productive water point is geared only for those members of the initial project. If it is, then the production systems enhancement process would take off for some but leave others behind.

Both the concept of non-garden members implementing new group projects, and the legitimacy of their management committees in the eyes of the older committees, are seen to be important issues by those consulted. No village or community plans have been drawn up yet to help coherent development at productive water points. As there are physical, social, financial and institutional constraints, the participative formulation and monitoring of community resource development plans that help identify and coordinate the different projects and management structures will be a useful next step in the research programme.

3.4 FINANCIAL SUSTAINABILITY OF PRODUCTIVE WATER POINTS

The CRMLS Phase 1 survey gave an opportunity for preliminary assessment of the degree to which productive water points and associated projects can be *financially* sustainable. Financial sustainability is considered in two parts: the potential to recover recurrent costs for O&M, and the potential to recover investment costs for new projects undertaken.

3.4.1 Cost recovery for O&M

Pilot scheme monitoring has noted that garden members are willing and able to undertake O&M of the productive water points without external assistance, by pooling cash and labour resources. This is in contrast to findings in most conventional water and sanitation projects, and may be attributed to the reliability of the water source (a highly valued benefit), income generation made possible by the production, community training and tools provided with the water point, and the strong sense of ownership and responsibility promoted by the scheme implementation process (Lovell *et al.*, 1996, Waughray *et al.*, 1995, Mazhangara *et al.*,1995).

During the pilot project, a willingness to pay (WTP) survey from a sample of 60 garden member and non-member households was undertaken as part of the return-to-household survey. This established that the mean WTP for maintenance of the collector wells was Z$4.67 per month or Z$56.04 per year per water user. To further explore this aspect, the CRMLS survey established

the current status of user payments. Table 3.1 shows information obtained from each pilot scheme committee, and shows the number of member and non-member households at each site considered to use the collector well for the majority of their domestic water requirements.

Table 3.1 Current user payment systems at collector well garden schemes.

Site	Amount paid (Z$) Garden members	Non garden members	Number of households Garden members: (user group 1)	Non garden members: (user group 2)
1	5/ year	0	134	
2	0.5/ month	5/ year	94	34
3	4/ month	2/ year	46	128
4	2/ month	1 as and when	84	44
5	10/ season	60* for life	50	80
6	5 at start 2/ month	0.5 as and when	87	80
Romwe	5/ 3 months	Zero but supply labour for repairs	50	don't know

* the figure of $60 for life for non-members at Site 5 arose from an open community discussion on the opportunity cost of labour that garden members had donated to initially build the scheme and that non-members should match if they wished to use the water

Apart from site 5, the current payment regimes are wide ranging and somewhat arbitrary. The fact that people are paying something towards repairs and maintenance does reflect an encouraging *actual* willingness to pay towards the recurrent costs of a productive water point, although for the most part these charges appear to have no economic basis or rationale and are focused on the premise of paying for repairs to the water point as and when needed rather than paying for the productive water *per se*. The survey noted that the majority of groups interviewed did express a willingness to pay on a *monthly* basis for general access to the water resource.

A further sample of 18 non-garden members were surveyed to find their WTP for collector well water. The results are shown in Table 3.2 overleaf. The sample expressed an average willingness to pay of Z$5.03 per month (s.d. 3.55) or Z$60.36 per year. Garden committee members estimated that an average of 78 Group 2 households per site use the wells. This gives a revenue of Z$4 708 that might in theory be collected each year from non-garden members at each pilot scheme. The range of values elicited make economic sense in terms of wealth of the respondents, with relatively more wealthy respondents giving a higher bid value per month than poorer respondents. Encouraging agreement was found between the 1996 survey and WTP figures elicited in October 1995 from a *different* sample of respondents (that combined garden members *and* non-members). Higher standard deviations in 1996 reflect the much smaller sample population of the CRMLS survey. Even without taking account of inflation over the period between the two surveys, there is no statistically significant difference between the samples.

At Zvada Kraal, respondents expressed a willingness to pay to maintain their current borehole water supply of Z$4.77 per household per month (s.d. 4.69) or Z$57.24 per year. This suggests that even where the user community is entirely based within a single kraal a revenue of Z$6 868 is theoretically possible. Re-investing this revenue net of O&M costs would allow productive initiatives to be implemented within the farming system. Although WTP responses at Zvada Kraal are lower, there is no statistically significant difference between willingness to pay for water at the collector wells (Z$ 5.03 / month) and at the borehole (Z$4.77 / month).

Table 3.2 WTP for water elicited from the CRMLS survey (1996) and the Return to Household Survey (1995).

Average WTP bid for water (Z$/month) from the collector well.			
CRMLS survey 1996 (non garden members; n=17)		**Return to Household Survey 1995 (non garden members; n=23)**	
Survey average	5.03 (s.d. 3.55)	Survey average (not adjusted to 1996 prices)	4.67 (s.d. 1.28)
By wealth *			
Least wealthy	4.00 (s.d. 3.67)		4.50 (s.d. 1.24)
Mid range of sample	5.58 (s.d. 3.72)		4.53 (s.d. 1.31)
Most wealthy	8.00 (s.d. 5.71)		6.10 (s.d. 0.8)

* In cross tabulating these bid responses by wealth, the 1996 sample was split into 3 groups of 6 based on a quantitative analysis of assets, the 1995 sample was split into three groups by enumerator observation.

3.4.2 Cost recovery for capital investments around productive water points

In 1995, the mean WTP to join a collector well garden was found to be Z$165.00 per member as a one off payment (Waughray *et al.*,1995). The CRMLS Phase 1 survey explored this concept further by analysing the potential for loan repayment systems that might be implemented to help members and non-members develop new initiatives around productive water points. Tables 3.3 and 3.4 show the WTP back a loan for new household-based and new group-based initiatives expressed by a sample of 17 collector well garden members. Tables 3.5 and 3.6 show the WTP back a loan for a new group-based project expressed by a sample of 18 non-garden members and by a sample of 20 families at Zvada Kraal borehole.

The average cash input required to start household projects was stated to be Z$200 pa. The output from these projects valued by respondents as gross margins at farm gate prices and not including opportunity costs of labour ranged from $100-2640 pa. If start-up costs cease after year 5 and recurrent costs and outputs do not come on line until year 5, the first five years of the new project would see a financial outlay of Z$1000 with zero income. Respondents were willing to pay back a loan over these first 5 years at an average of Z$23 a month. Given a loan of Z$1000 in year 1 and a monthly repayment of $23 in years 1 to 5, a FRR for the first five years is calculated to be 12% and represents the maximum rate of interest which the household could afford to pay on a loan of Z$1000 and still break-even.

Table 3.3 The WTP back a loan for a new household-based project by collector well garden members

Average WTP back a loan over 5 years		Z$ per month
	i. **whole sample** *	**Z$ 23.00** (s.d. 16.23)
	ii. least wealthy category	Z$ 25.00 (s.d. 20.81) range *Z$0 - Z$40*
	iii. mid-category of wealth	Z$22.50 (s.d. 16.35) range *Z$15- Z$55*
	iv. most wealthy category	Z$22.00 (s.d. 16.04) range *Z$10-50*
Net Present Value of project in year 1 (13% discount rate)**		Z$ 970.76
Financial Rate of Return		12 %

* one outlier was removed

** Based on 13% discount rate, the NPV of such a project in year 1 that the member family could invest in would be Z$1 668.

Table 3.4 The WTP back a loan for another group-based project by collector well garden members

Average WTP back a loan after 10 years		Z$ per month
	i. **whole sample**	**Z$ 21.92** (s.d. 12.16)
	ii. least wealthy category	Z$20.00 (s.d. 5.0) range Z$15- Z$25
	iii. mid category of wealth	Z$21.00 (s.d. 14.32) range Z$10- Z$45
	iv. most wealthy category	Z$28.00 (s.d. 2.74) range Z$15- Z$40
Net Present Value of project in year 1 (13% discount rate)*		Z$ 111 330.88
Financial Rate of Return		13 % if scheme capital cost is Z$ 110 272** (the capital cost of pilot schemes)

* The NPV in year 1 is based on a 13% discount rate, a 10 year time horizon, and an average group size of 78 members (based on pilot project schemes) paying back Z$21.92 per month.

** The loan is for the capital cost of the scheme. Both recurrent costs and gross margins are assumed zero until year ten. Thereafter gross margins are presumed to be greater than recurrent costs in each year

Table 3.5 The WTP back a loan for a group-based project by non-garden members

Average WTP back a loan over 10 years for:	Z$ per month
i. whole sample	**Z$ 20.00** (s.d. 15.81)
ii. least wealthy category	Z$ 14.17 (s.d. 4.91) range Z$10- Z$20
iii. mid category of wealth	Z$20.00 (s.d. 16.73) range Z$0- Z$50
iv. most wealthy category	Z$27.00 (s.d. 22.53) range Z$5- Z$50
Net Present Value of project in year 1 (13% discount rate)*	Z$ 101 579.27**
Financial Rate of Return	11% if capital cost per scheme is Z$ 110 272**

Table 3.6 The WTP back a loan for a new group-based project by a sample of households at the Zvada Kraal borehole.

Average WTP back a loan over 10 years for:	Z$ per month
i. whole sample	**Z$ 15.89** (s.d. 10.78)
Net Present Value of project in year 1 (13% discount rate)	Z$ 80 704.74.
Financial Rate of Return	4% if capital cost per scheme is Z$ 110 272

* The 20 respondents at Zvada kraal borehole also expressed an average willingness to pay to join a collector well scheme as a one of fee of Z$47.05 per person (s.d. 20.61). For a 78 member scheme this would represent a group total of Z$3 669.90. (The sample were familiar with the collector well garden at Mawadze.)

3.5 SUMMARY OF FINDINGS

- The CRMLS Phase 1 survey identified at least three different user groups at the productive water points. These operate at different spatial and temporal scales, place different demands on the productive water points, and pose difficult management questions regarding equity, O&M and the initiation of new projects at the water points.

- Both the concept of non-garden members implementing new projects, and the legitimacy of their management committees in the eyes of the older committees, are seen to be important issues.

- Institutional sustainability of productive water points is linked to at least four key issues:

    1. The implementation procedure used to set up the initial scheme
    2. Local property rights to land, water and other natural resources
    3. Management structures around the productive water point
    4. The size, diversity and membership of associated projects

- On cost recovery for O&M, the survey identified various water user payment systems currently operating at pilot schemes. For the most part these are focused on the premise of paying for repairs to the water point as and when needed rather than paying for productive water *per se*. The survey obtained stable monthly WTP for water figures from non-garden members which compared well with figures obtained previously from a different sample in 1995.

- On cost recovery for capital investments in new projects a number of scenarios were investigated. Using financial data on household and group projects provided by the communities, this preliminary WTP analysis indicates that (in theory) there is considerable potential for different groups to start new projects by paying back loans. Future research should investigate mechanisms whereby: revenue generated by a water charging system can stay in and be managed by the local community; a proportion can still be used for recurrent O&M costs; payment by an individual or group entitles involvement in decision making at the water point; excess revenue generated by charging can best be utilised for production enhancement.

- By way of example, this survey identified that Z$5 288 pa could in theory be collected from monthly payments at each collector well. This revenue could be used for:

    ◊ routine operational and maintenance costs for the water point
    ◊ a degree of cost recovery on the capital cost of the scheme
    ◊ reinvestment in the garden or other group ideas
    ◊ collateral or security for group loans;
    ◊ committee for further development of surrounding production systems and livelihood strategies.

    If researched, designed and implemented properly, the potential to capture and utilise these economic resources for the further benefit of the communities is both large and ultimately self-sustaining.

- No village or community plans have been drawn up to help coherent development at productive water points. This has important implications for future research as there are clearly physical, social, financial and institutional constraints. Participative development and interdisciplinary monitoring of community resource management plans in communal and resettlement areas would seem a useful next step that would help to identify the principles and community organisational structures required for sustainable water resource management and production enhancement.

4. Future Research and Development

4.1 THE POTENTIAL IMPACT OF PRODUCTIVE WATER POINTS IN SEMI-ARID AREAS

4.1.1 Local level impact

Clearly, from the evidence of this survey, productive water points both surface and groundwater-based do have a significant impact on the surrounding farming systems and livelihood strategies of the communities who live there.

A wide range of group or community-focused projects have started as a result of pilot schemes. These include projects that involve the purchase of equipment, the securing of credit facilities, and the accessing of other "matching-fund" type rural development initiatives that can now be utilised. In terms of individual or household-based income generation projects, the majority of members report that they have started a new project or improved an existing one as a direct result of the productive water point. A third of non-scheme members surveyed also said they have started new activities.

Respondents reported that the productive water points have given people the opportunity to share their experiences and skills, to work as a unit, and to pool ideas on different aspects of potential projects so that they can succeed. Importantly, people are also expected, and are now able, to contribute *money* to these new ideas. The survey recorded a mean estimated income of Z$280 per member per year. Although relatively small in some cases, this income accrues to a *wide spread* of members. For those with limited access to cash or productive resources to start their own income generating activities, obtaining a steady seasonal income from the productive water point lowers elements of risk and insecurity in the household budget and decision-making process. Some of the key constraints that households face in terms of getting involved with joint ventures in the community are eased, and the opportunities for entrepreneurial activity are increased. This is reflected clearly in the amount of *group* activities and the size and success of savings clubs towards which scheme members feel they can now safely contribute some of their household income.

The majority of members report that they have also experienced positive improvements in their farming practices as a result of the productive water points, mostly through the purchase of inputs to improve rainfed farm productivity. Importantly, this includes an increase in the renting of labour. Removal of labour as a constraint is also decreasing the seasonality of the costs and benefits at the margin of garden production and growing and selling periods at the schemes are increasing. Non-garden members report that they have also experienced some improvement in their farming system since introduction of the productive water points. Both sub-samples drew attention to the significant improvement in agricultural extension advice that has occurred. Other benefits cited include a strategic advantage for members in terms of ability to buy seed and sow earlier in the season, thereby ensuring better yields and first crops at market, and the water charges now being placed by water point committees to pay for O&M which are also beginning to be seen as a good source of income.

Preliminary surveys at a conventional (non-productive) borehole draw attention to the difference that a secure source of income from a productive water point can make in enhancing broader production systems. Although the borehole community can design group-based activities as coherently as communities at productive water points, neither the financial impact of the conventional water point nor the implementation of new projects is prevalent. There

remains a lack of collective action or sense of collective responsibility regarding ownership, management and development at the conventional water source. Repairs to the borehole still have to be undertaken by the District Development Fund and support for new projects still has to come from a donor or the Rural District Council.

The absence of an initial income generating opportunity developed with the conventional water point is thus very important. Without an initial income reliable and simultaneously accessible to many people, the development of community-based activities is constrained, productive capacity of the water point remains diffuse and under-utilised, and generally supports only individuals with access to the resources required for projects such as brick making or brewing. These individual activities remain reactive to seasonal income needs and not proactive in the generation of a financial surplus for the household or community to reserve or reinvest.

4.1.2 Regional level impact

The original ODA TDR research programme on collector wells began because approximately two-thirds of the world's semi-arid areas (and virtually all of Africa) are underlain by crystalline basement rock, and the aquifers in this geology are generally under-utilised because of technical difficulties of abstraction (Anon., 1989; Wright, 1992). As well as indicating the range of benefits that increased abstraction from basement aquifers can bring to local communities in semi-arid areas, three important findings of the recent pilot project in Zimbabwe were:

1. the limited extent to which these aquifers are utilised at present;
2. the potential to make more effective and economic use of existing water points, particularly those high yielding conventional deep boreholes presently under-utilised due to limited pumping capacity of single Bush Pumps fitted;
3. the potential to develop productive water points in other areas by siting and selecting appropriate well designs, that include collector wells but also include conventional deep boreholes, screened-regolith boreholes and large-diameter wells.

The use of groundwater in semi-arid Communal and Resettlement Areas of southern Zimbabwe is currently only about 4 per cent of annual average recharge (Lovell *et al.*, 1996). There is clear potential for increased usage of this resource for improved water supply and production if the aquifers can be developed and managed appropriately. Studies in Malawi and Uganda also indicate that development of the shallow basement aquifers may hold the key to future resource development there (Chilton and Smith-Carington, 1984; Howard and Karundu, 1992). ODA is presently considering the funding of a numbers of projects to develop productive water points in semi-arid areas in Zimbabwe, South Africa and India. NGO's in the region are considering similar projects in Malawi, Zambia and Mozambique. The potential impact of productive water points in semi-arid areas is clearly vast, both at local and regional level, and warrants the careful design and implementation of an interdisciplinary research programme to underpin this development.

4.2 PHYSICAL SUSTAINABILITY

The issue of physical sustainability of productive water points was raised by many stakeholders. Three issues in particular were discussed:

1. The need to quantify the available water resource and the effects of various land management practices on this resource base.
2. The need for modelling to provide a framework to predict the likely impact of various interventions, both spatially (down-stream) and temporally (through rainfall cycles).
3. The need to put communities and extension agencies in touch with this information.

The consensus on (i) is to build on the methodology for sustainable water development started at Romwe and instrument a number (4) of other small catchments to provide this information in the other principal physical settings (geology, soil, land use). The development of productive water points (either surface or groundwater-based) is seen to provide the ideal opportunity to work collaboratively with the local community and promote subsequent participatory research. A cost-effective approach recommended for the future programme is to identify and develop 4 existing but under-utilised water points in the principal physical settings required. One or more could be small dams rehabilitated by CARE in their ODA-supported programme. These instrumented small catchments in different physical settings should ideally be nested within a larger river basin. This is possible in the case of the Chiredzi river, for example, and Commercial sugar estates downstream of Communal and Resettlement Areas in this catchment have expressed interest in supporting what could be an extremely valuable `semi-arid' pilot catchment study for the national Water Resources Management Strategy (WRMS). Further details of the discussions and ideas on this aspect are given at Appendix 5.

On (ii) the consensus is to continue to use and develop the ACRU Model in collaboration with staff of the University of Natal. This model has proved useful in theoretically testing various "what-if" management scenarios using the physical data collected at Romwe and is beginning to highlight both good and bad management options for this physical setting (Butterworth *et al.*, 1997a,b,c,d). Again it is recommended that the use and development of this model be in full collaboration with national staff and as an integral part of the WRMS.

On (iii), there is little evidence of natural resource management initiatives occurring spontaneously with the introduction of productive water points, although increased agricultural extension advice was reported (extension staff capitalising on the natural meeting point provided by the schemes) and this, combined with the local organisational structures developed, appears to have increased general awareness of water resource management at these sites. If the environment is viewed as a normal economic good, then this behaviour by the communities is perfectly rational. As higher income levels and greater income security is generated, so can the household afford to become more concerned about or invest more time and energy into environmental conservation. In the interim, the payment of school fees or the purchase of new bolts for the plough take precedence.

What is needed to ensure physical sustainability is clear links between the natural resource base and the income being derived from the productive water point and associated projects. In this way, the community has a clear incentive to implement and enforce its own natural resource management systems to ensure continued income generation and diversification. Obviously, other issues will also influence the level of commitment that people place on long term environmental management initiatives, including security of tenure, the increasing sub-division of land holdings, the management of common property resources, off-farm employment opportunities, and the traditional right to return to rural homesteads. These issues must be considered in the future programme.

The consensus of CRMLS Phase 1 is that productive water points do offer the potential to encourage community-based natural resource management strategies, but that these will not necessarily occur spontaneously. There is need to establish clear links between the natural resource base and the income being derived from the productive water points and associated projects, and this can best be achieved by an environmental education programme with a shift in emphasis from the present extension-to-farmer approach to a more exposure-oriented transfer of appropriate technology and ideas. It is recommended that the instrumented catchments be used for demonstration purposes and that the future programme capitalise on local experience of participatory approaches to resource development by organisations such as Intermediate Technology Development Group (ITDG), ZIMTRUST, African Centre for Holistic Resource Management (ACHRM) and AZTREC.

4.3 INSTITUTIONAL SUSTAINABILITY

The social boundary within which community management decisions and interventions (and future research studies) should be undertaken received much attention during CRMLS. Essentially, from a development perspective, there is still much to learn. First productive water points in the pilot project were implemented to serve various numbers of kraals within different organisational boundaries entirely according to local community wishes. This produced schemes that are productive but with some difficult management problems and issues of equity now surfacing. With the benefit of hindsight, perhaps insufficient attention was placed on defining the appropriate organisational boundary for each productive water point and ensuring participation of all stakeholders within this boundary. This was, and remains, difficult without prior knowledge of the available water resource (Section 4.2). The CRMLS water user analysis highlights two guiding principles for design and management if the positive impacts of productive water points are to be nurtured and are to be sustainable.

Firstly, social and physical boundaries are key factors but differ. During scheme implementation, effort should be made to promote involvement of *all* who may subsequently use a productive water point. This social boundary will often be wider than the immediate hydrological catchment affecting the water resource. Some users will live and undertake activities outside the physical catchment. Community organisational structures, administrative boundaries, and even structural changes in the economy, all affecting household decisions, will also all operate at scales different to the hydrological catchment. Although the hydrological catchment is clearly important to sustaining the water resource, the organisational boundary within which management decisions are made is more important, and should include all stakeholders in the water point and related activities. For the purposes of interdisciplinary study and integrated management of the activities that are occurring, the small catchment should be used as a focus for physical data collection but a wider boundary (the village or ward) should be used for social data collection, nested within the district, provincial and national policy arena.

Secondly, productive water points and associated projects should not be treated as closed systems, and community-based management strategies to cope with the demands of different user groups must be considered during scheme implementation. Households immediately surrounding the water point may form the majority of Group 1. A more disparate user community drawn from a broader section of households may form Group 2. A scattered and variable population of water users may form Group 3. Enabling each of these user groups to meet and discuss their access to the opportunities for production is critical to equitable implementation and management of the productive water point. Ideally, every household will have the opportunity to be in Group 1. However, community need generally far exceeds the productive potential of single water points at present, and the ideal will only become possible

when sufficient water points can be implemented to allow Group 1 organisational boundaries to be matched to the safe yield of individual water points. Until this time, and while water resource constraints prevail, opportunities for involvement in projects related to productive water points should be maximised, for example, by promoting community links with external agencies and matching-fund type programmes. The consensus of opinion is that there is need to investigate the potential for further macro and micro economic interventions that help to put money and resources into the hands of rural communities and thereby encourage self-initiated development.

Appendix 3 highlights some of the more apparent issues affecting institutional sustainability and provides an agenda for applied social research required. The issues include security of tenure for specific user groups, equity and membership, the importance of scale to social cohesion under the "indaba tree", mobility within PWP projects, the use of regulations evolved and enforced locally, accountability, development of community management skills and systems, conflict resolution, links with Government institutions and enabling policies. A participatory method that goes beyond "appraisal" into a shared analysis and understanding of micro water projects is recommended.

4.4 FINANCIAL SUSTAINABILITY AND COST RECOVERY

Economic information collected during the CRMLS Phase 1 survey indicates potential for more defined and well targeted cost recovery or resource pricing systems at productive water points. The potential exists to build upon the water payment systems that have emerged and to capture more revenue for communities to use for operation and maintenance and for starting new projects. The chance to design such systems only seems possible because of the productivity enhancement the water points have brought in a relatively short space of time.

Although systems for obtaining money for maintenance now exist, the survey found that a conceptual leap would be required to begin charging for the productive water *per se*. If the water is treated as an economic good then currently, for most water users, the resource is undervalued (they have a large consumer surplus *vis a vis* the current low or zero cost of the water). Water charges that more realistically reflect the economic or scarcity value of the water could be set for different water user groups. These could be derived from further WTP studies looking at the value of reliable and productive water supplies, examining both the economic cost of supplying the water and the range of productive benefits gained, and linking this information to hydrological data on the safe yield of water through time. Importantly, organisational structures are required that allow revenue generated from these systems to be held and re-invested locally, perhaps with cross-subsidisation systems to assist poorer members of the community. This kind of approach could well be the way forward in terms of achieving a shift from the current *ad hoc* charges for repair to a more regular and economically rational system of payment for the water itself.

On WTP back a loan either for a productive water point or for a new project at a productive water point, it seems that a staggered or incremental repayment approach has many more positive implications for designing a workable and worthwhile cost recovery system. The loan regime data collected in this survey could serve as a starting point for identifying what kinds of repayment schedules are realistic for communities in semi-arid rural areas. This information should be linked to further research on the costs of the different water supply options.

Scant research focuses on the economic *incentives* required to get either individuals or communities involved in a water development initiative or management system. As a result, recommended resource management policies, more often than not, emphasise long term

conservation and restraint through price or legislative *disincentives* rather than highlighting any potential or demand-led economic or financial *incentives* for productive water resource development. This conservationist policy approach often contradicts many of the livelihood strategies which are actually pursued in areas where water, food and income supplies are viewed as insecure and vulnerable to exogenous stresses such as drought and economic change, and where the demand exists to exploit the productive potential of rural water points. The Zimbabwe CAMPFIRE programme treats wildlife (rather than water) as a productive resource and is clearly an exception to this case (Appendix 3). Its relative success demands further analysis in CRMLS Phase II to see if the analogy is helpful and if the lessons of CAMPFIRE can be applied where using water (rather than wildlife) as the productive resource.

The CRMLS Phase I survey, although preliminary, suggests that a focus on the economic *incentives* necessary for rational water resource management (rather than on price or legislative *disincentives)* does become possible by developing the productive use of water supplies in water insecure locations rather than developing the resource primarily for domestic use as in conventional water and sanitation projects. However, to design successful incentive-driven management or cost recovery systems for water (or any other natural resource) future economic research will have to consider

- the different boundaries and competing demands surrounding common property water resources
- present constraints facing the community and the individual water user
- the different perceptions of, and fluctuations in, the value of water as a productive resource;
- household income sources (including remittances), income security, and re-investment strategies
- minimum rather than average values of WTP for water
- price and income elasticities of demand for water based on WTP values elicited.

4.5 COMPLEMENTARY ODA RESEARCH AND DEVELOPMENT PROJECTS

Much information has been collected since the ODA research programme began in southern Zimbabwe in 1983. From a synthesis of the findings to date it can be said that, among a wide range of benefits, productive water points help to create:

- a sense of collective responsibility
- an accessible and reliable income generating opportunity
- a positive influence on livelihood strategies and farming systems
- an increase in general awareness of natural resource management, although to a lesser extent than some other benefits

However, key issues which affect long-term viability of the project as a credible and sustainable water supply and agricultural development option for semi-arid areas, and which are already affecting pilot schemes, are:

- physical sustainability of the water resource
- institutional sustainability of the local community organisational structures
- financial sustainability of the water points and associated activities
- down-stream impacts

CRMLS Phase I research has indicated that these issues are important to stakeholders at all levels, that they do create tensions and competing user demands, and that further research is

required on a wide range of aspects in order to identify the principles and organisational structures best for water resource management in semi-arid Communal and Resettlement Areas.

Detailed monitoring of a number of productive water points implemented and managed in different ways in the principal physical and social settings is considered vital. This requires an experimental design that can integrate physical, social and economic studies within the relevant boundaries. Considered by discipline, the principal areas of research identified include:

Physical

- Decision support to site and select appropriate well designs (including existing, under-utilised water points)
- User-friendly pump design to match increased abstraction at productive water points
- Pest and disease control and crop diversification in irrigated community gardens
- Quantification of the available water resource under present management in the principal physical settings
- Quantification of local effects of different management on the water resource (by measurement and modelling)
- Quantification of regional and down-stream effects within the river basin (by measurement and modelling)
- Participative development of village or community plans to help coherent development at productive water points
- Use of demonstration catchments to facilitate more exposure-oriented transfer of appropriate technology and ideas

Social, legal and institutional

- The implementation procedure used to set up the initial productive water point
- The effects of size, diversity and membership of productive water points and associated projects
- The effects of local property rights to land, water and other natural resources
- Issues of equity, particularly regarding membership of and access to the resource by different user groups
- Appropriate management structures around productive water points considering the different user groups
- The impact of productive water points and associated projects on livelihood strategies and farming systems through time, and the feedback mechanisms ultimately affecting the water point and production systems
- Case studies in the different social settings created by Communal and Resettlement Areas
- Access to information and ideas for matching-fund type programmes, credit facilities and new projects

Economic

- The economic component of decision support for siting and selecting appropriate well designs
- Crop marketing and diversification strategies
- Cost recovery mechanisms and organisational structures for water point operation and maintenance
- Cost recovery mechanisms and WTP for investment in the productive water point and or associated new projects
- The implementation of rational water user systems

- Mechanisms and organisational structures for micro-credit and re-investment programmes

Clearly, the list of identified research needs is very long. Many are in fact interdisciplinary and cannot be considered in isolation. The list has been defined over a considerable period of time by stakeholders at all levels (Appendix 7). The list of identified research needs is long. It is recognised that this goes beyond the remit and likely funding capacity of the ODA Natural Resources Semi-arid Production Systems Programme and Engineering Division alone. It is also recognised that the Institute of Hydrology and counterpart organisations in Zimbabwe, although taking an inter-disciplinary approach to the research programme can still benefit from the skills and experience gained from other research projects in related areas.

However, Figure 1 indicates how the ODA ED/NRSP funded research activities could be linked to complementary ODA TC funded development activities in Zimbabwe to pursue the broader resource management project that is required.

4.6 LOGICAL FRAMEWORK FOR CRMLS PHASE II

The exact partition of activities under the TC and ED/NRSP funded projects is difficult to define in detail, principally because the "shape" of the development projects NGADI and CMPWP in Zimbabwe is yet to be finalised. The following Logical Framework for research in CRMLS Phase II is therefore a draft, developed with stakeholders at all levels during CRMLS Phase I to complement the development projects described in Figure 1. As changes to the design of one or other component of this programme are considered and made, discussions between the authorities responsible for ED/NRSP and TC funds will be vital to maintain the overall balance of the programme as a whole.

Project Logical Framework

Project Title: CRMLS Phase II. Period of Funding: Oct 1997 - April 2000			
Narrative Summary	**Objective Verifiable Indicators**	**Means of Verification**	**Important Assumptions**
Goals: 1. Improved availability of water for sustainable food production and rural development (Eng. Div. W5) 2. Commodity production increased through improved conservation and use of water resources (SAPS Purpose 1)			
Purpose: Appropriate catchment management strategies developed and promoted			The enabling environment for the widespread adoption of the project outputs exists
Outputs: 1. 3 additional instrumented study areas for monitoring the impact of PWP's are established 2. An optimal set of enabling mechanisms for implementing PWP's are identified and evaluated at each study area 3. Methods for the sustainable community based water management are developed and tested 4. Decision trees and support systems are produced for the optimal development and management of water in the context of semi-arid natural resources systems 5. Policy implications of the research activities are assessed with WRMS and other stakeholders 6. A range of dissemination products and training materials are produced.	1. Three further catchments are instrumented and monitored 2. From activities 21 and 2.2 a set of enabling mechanisms able to help maximise the opportunities available from PWP's is developed. 3. From activities 3.1 and 3.2 rational and participative water management systems are developed and evaluated 4. From activities 4.1- 4.4 practical decision trees and support systems for sustainably utilising water and related natural resources in semi arid systems are developed and evaluated. 5. From activities 5.1-5.2 a wider policy framework for managing production systems within the context of developing water and related natural resources is constructed 6. Journal and conference papers, magazine articles are produced; project findings are also disseminated through a range of other media	1. ODA review and progress reports 2. ODA review, progress reports and wider publications 3. ODA review and progress reports 4. ODA review, progress reports and wider publications 5. ODA review, progress reports and wider publications 6. ODA review, progress reports and wider publications	Project outputs are disseminated and adopted.

Activities: 1.1 Identify the systems boundaries for, and instrument, three additional small catchments to study 1.2 Develop and test participatory and formal survey methods for evaluating the impact of PWP's 1.3 Collect and analyse baseline multidisciplinary data is collected and analysed for these study areas 2.1 Develop, implement and evaluate a participatory rolling research and intervention plan for each study are 2.2 Collect and analyse multidisciplinary data on the impact and uptake of the research and intervention plans. 3.1 Quantify and model the sustainability of utilising groundwater and the feedbacks that exist between land management techniques and groundwater recharge at each study area 3.2 Design, implement and evaluate community based economic systems for groundwater management in the study areas 4.1 Establish a multidisciplinary and relational database incorporating production system, water and related natural resources data obtained from the study areas. 4.2 Use integrated modelling combined with participatory decision making techniques to develop water and related NR production and management strategies for each study site 4.3 Use activities 4.1 and 4.2 to support and evaluate research and intervention plans 4.4 Translate findings into practical decision trees and evaluate with communities at each study area. 4.5 Provide other research and TC projects with information gained from activities 4.1-4.4 and use feedback to strengthen findings 5.1 Scale up project findings for stakeholders (eg. WRMS, R&SS, Agritex) 5.2 Assist stakeholders to construct larger scale strategies for managing production systems in the context of developing water and related natural resources 6.1 Prepare and distribute the range of project findings in a wide variety of formats	Inputs/ resources *97/98 98/99 99/2000* a) 85.6 88.2 90.8 b) 14.5 14.9 15.4 c) 20.0 10.0 - d) 34.5 35.5 36.6 e) 5.0 5.2 5.3 f) - - - g) 23.5 35.5 36.6 h) 183.1 189.3 184.7		• Resources are available • Collaborative links with other research institutes/NARS/ are maintained • Linkages are developed with relevant ODA TC, NRSP projects and other relevant NRM initiatives

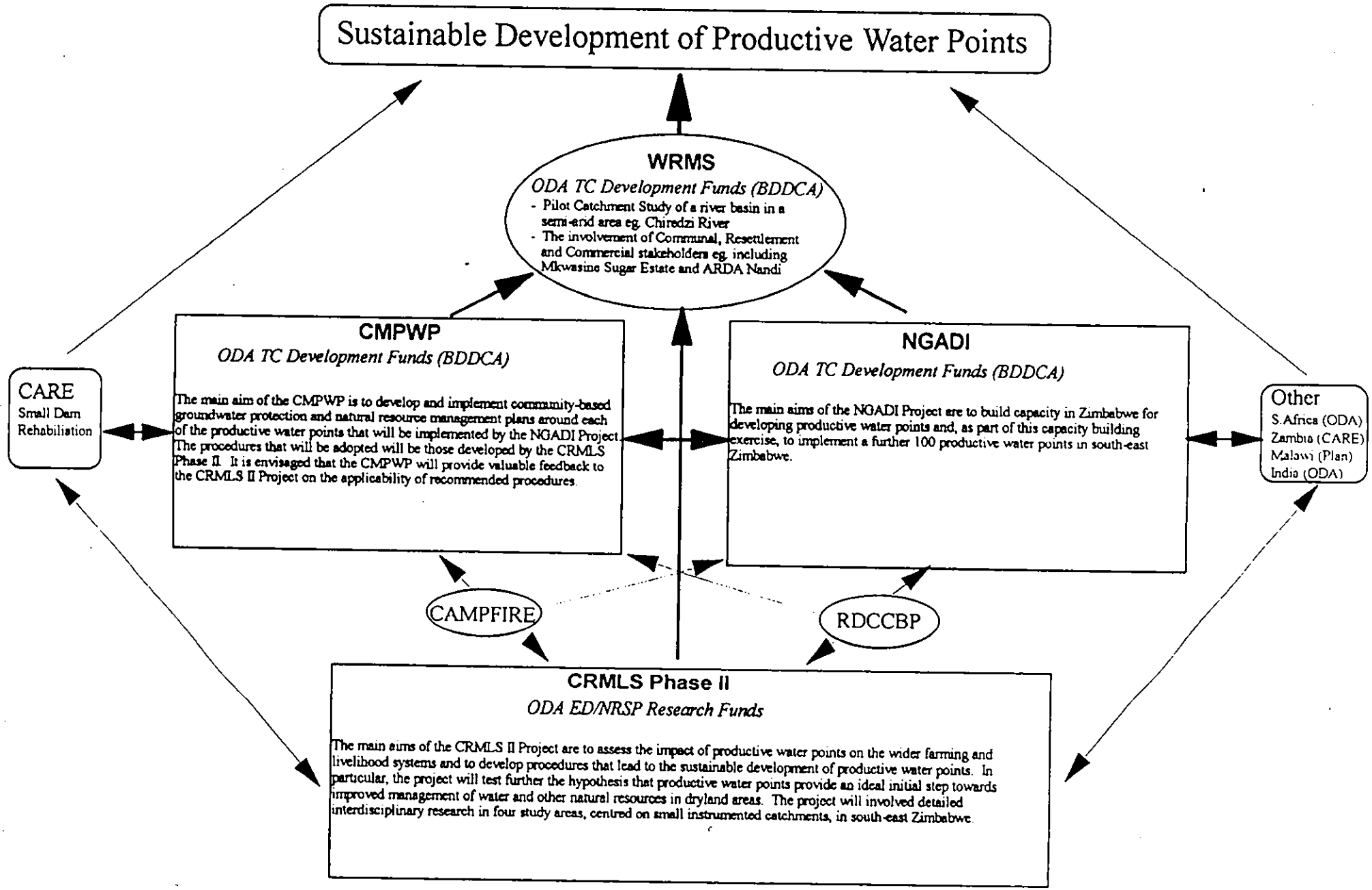

Figure 1. Complementary ODA Research and Development Projects

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APPENDIX 1: Objectives, methodology and issues addressed by the fieldwork

A1. OBJECTIVE 1

WHAT ARE THE IMPACTS ON COMMUNITIES OF THE COLLECTOR WELL AND GARDENS?

Much of the evidence for the impacts will be obtained from past pilot project reports and ongoing socio-economic monitoring. Some additional survey fieldwork is needed to focus on the series of points listed below. Information will be pursued under the following broad headings: magnitude of impact; significance of impact and change over time of impact for both members and non members.

- the use of income generated by the schemes; the impact of the schemes on spending patterns
- vegetable consumption patterns
- the impact of the schemes on other private gardens or income generating activities in the catchment
- competing demands for water the schemes may promote - domestic vs. irrigation vs. livestock; member vs. non member; catchment population vs. outsiders; seasonal and hierarchical differences. How are these being resolved?

For the site with no scheme a general level of background socio-economic information needs to be elicited (Waughray *et al.* 1995 for a detailed questionnaire). Information from the non project site also needs to be obtained on methods of generating income and current spending patterns; on vegetable consumption patterns; on the impact of any nearby community based schemes on private gardens or income generating activities in the catchment. In terms of competing demands for water, the questions should centre around boreholes or surface water sources.

A2. OBJECTIVE 2

HOW DOES THE COLLECTOR WELL AND GARDEN SCHEME PROVIDE SUFFICIENT SOCIAL, ECONOMIC AND INSTITUTIONAL INCENTIVES FOR

- *ENHANCING LIVELIHOOD STRATEGIES*
- *IMPROVING PRODUCTIVITY OF FARMING SYSTEMS*
- *ENCOURAGING NATURAL RESOURCE MANAGEMENT STRATEGIES ?*

This is the area of analysis critical to Phase I of CRMLS and is thus where most of the fieldwork time and energy will be spent. The impact of the schemes on the wider production systems has been split into the three distinct, but related categories listed above. Each of the three categories of objective 2 can thus be critically evaluated using a common set of questions/ discussions topics.

For the natural resource management (NRM) strategies, further sub groups of investigation will centre on the different types of resource that are managed - water, soil/ land, forestry/ wood, livestock / grazing. An aim of the work in this area is to ascertain what kinds of environmental benefits the schemes may promote, particularly insofar as identifying whether they are direct (less streambank cultivation, less trees cut down, less pressure on marginal lands); or indirect - more investment in soil conservation, diversification into non-farm activities).These questions and discussions will be centred around the points listed below. Information on these points will be obtained through group PRA sessions and household based questionnaires.

1. What are the (livelihood strategies/ farm interventions to improve production/ NRM strategies) currently undertaken?

2. By whom - divisions of labour within household/ groups/ community/ catchment?

3. How are the (livelihood strategies/ farm production interventions / NRM strategies) currently organised? At what scale - household/ group/ community/ catchment

4. What institutional mechanisms are in place for managing, enforcing, guiding these strategies

5. Are they successful?

6. Is this different from before the collector well?

7. What are the answers to 1,2,3,4,5 for before?

8. Have any new strategies (community or individually based) been undertaken since the CW

9. Has the collector well been the reason for the change? Other reasons?

10. How - through what impacts?

11. What has been the significance or magnitude of these impacts?

12. Do they change over time?

13. Are there any constraints remaining on how things could be done?

14. What are they?

15. How could these be removed?

16. Do non members join these strategies. Would they like to?

The experiences of other projects in the region (CARE, ITDG, Dandana community project) on this issue will also be sought. A similar emphasis is to be drawn up for questions 1,2,3,4 relating to the site with no CW and garden.

A3. OBJECTIVE 3

IF THE INCENTIVES ARE PRESENT FOR A POSITIVE IMPACT ON WIDER PRODUCTION SYSTEMS, WHAT INITIATIVES CAN BE SUPPORTED BY THE WATER POINT AND GARDEN FOR

- ***ENHANCING LIVELIHOOD STRATEGIES***
- ***IMPROVING PRODUCTIVITY OF FARMING SYSTEMS***
- ***ENCOURAGING NATURAL RESOURCE MANAGEMENT STRATEGIES***

WHAT ARE THE CONSTRAINTS TO THESE INITIATIVES?

The aim is to identify and prioritise those demand led CRMLS initiatives that a Phase II could help communities undertake, and to identify issues that may currently hinder their implementation. This is a clear objective of the CRMLS Phase I fieldwork, but perhaps secondary in terms of field work time to objective 2.

i. Fieldwork to identify and prioritise demands for wider initiatives from different social groups, farmers and households within the catchment under the three topics that can be clearly related to the incentives promoted by the CW and garden project - discussions should revolve around initiatives that the benefits from the CW and garden could realistically support (e.g. through its benefits of capital, collective action, clean water, garden produce etc.), and not around a more general community "wish list". Has the experience of community based activities centred on the management and running of the garden and water point enhanced the desire to do further community-based work?

ii. Related fieldwork to identify any constraints to these initiatives that are external to the CW and water point scheme - e.g. tenure security, institutional structures (kraal vs. committee vs. WEDCO etc.), unhelpful legislation, inadequate extension support and advice, lack of education and training, poor access to credit or loans etc.

A4. THE DIRECTIONS USED FOR THE GROUP WORK

Enumerators:

From LVRS :	Terrence Dube, Godwin Mtetwa and Miriam Mtetwa
From Institute of Hydrology :	Chris Lovell, Patrick Moriarty and Dominic Waughray
External advisor :	Dr. Fanuel Nangati

A4.1 Instructions

Ask the group to construct a map of their locality showing the collector well and garden in middle, where each of their farms lie; where the biggest and smallest farms are, where private gardens are. Classify where the resources are in the locality - water, soil/land/ wood/ forests/ livestock/grazing and any areas where these resources are under pressure. Draw circles or arrows around the well and garden indicating from where members come from, where people who use the water come from, and in times of water scarcity where people who use the water come from.

A4.2 For group discussions:

1. What has been the impact of the collector well and garden on other private gardens in the locality?

2. What has been the impact of the collector well and garden on other income generating activities?
Add to the map or discuss the competing demands for water the schemes may promote - domestic vs. irrigation vs. livestock; member vs. non member; catchment population vs. outsiders; seasonal and hierarchical differences (size of stick = size of demand), look to the boundaries or arrows around the map for the different user groups that are identified - describe how these may change seasonally.

3. If there was no collector well garden, what do you think would be other ways to use the CW water?

4. How do you accommodate these different demands (use map/diagram). How are these being resolved?

5. Which are the 5 most common kinds of non-farm income generating activities currently being pursued in the community? Using the 5 sticks provided rank the most to least important activity by size of stick.
Also add them to the map - no. of stones = no. of people involved. Indicate where they take place - at home, at markets, in townships, etc. Arrows to represent the flow of the enterprise - to outsiders, to other in the community.....

6. Which of these 5 has the collector well been helpful towards supporting?

7. If none, has the CW been helpful in supporting any non-farm income generating activities currently being pursued in the community? If so, what are they? Add them to the diagram

8. Are there any other activities that you'd like to pursue? Prioritise 5 using the stick method. What's the most important thing stopping you?

9. Do you think that the experience of having a collector well and garden project in the community will help you devise other activities in the future?

A4.3 Questions concerning farming

10. Have you observed any changes in labour patterns on other peoples farms? Are people farming less in the wet season? Have streambank or private gardens been affected?

11. On map indicate where people are farming less/ where changes in farm patterns have occurred. Discuss the changes. If yes, do you think this is as a result of the CW and garden?

12. Add on to the map of locality any current natural resource management strategies - e.g. systems for managing water, the soil or land, forestry or wood, livestock or grazing. How many people are involved (number of stones), where do they take place

13. Promote discussions on the natural resource management strategies currently being undertaken.

14. How are the natural resource management strategies currently organised? At what scale - household/ group/ community/ catchment. What rules are in place for managing, enforcing, guiding these strategies? Who does what - e.g. who stops you cutting wood, allocates land etc. Are they successful?

15. Is this different from before the collector well?

16. Have any new strategies (community or individually based) been undertaken since the CW

17. Has the collector well been the reason for the change? Other reasons?

18. How - through what impacts?

19. Are there any constraints remaining on how things could be done?

20. What are they?

21. How could these be removed?

22. Do non members join in these strategies. Would they like to?

23. If not achieved already within each group establish and prioritise the 5 further activities that could be promoted for each sub heading - livelihood strategies, farm interventions, NRM.

24. To identify institutional constraints within the group, ask who would you approach to organise, start, fund these projects:

    i. kraalhead
    i. headman
    ii. councillor
    iii. extension officer
    iv. other - specify

25. Have you sent these ideas to the councillor? What has the response been? Any feedback?

A5. SPECIFIC ISSUES ADDRESSED BY THE SURVEY

A5.1 A socio-economic update on the pilot project schemes

The CRMLS Phase I fieldwork process provided some useful general updates on socio-economic information with regards to the impact of the pilot project collector wells and community gardens. A comparison of the 1996 survey with that data obtained before and during the pilot project also serves to indicate the stability of the survey results and draw attention to any immediate or obvious differences, particularly as the sample size for the

CRMLS survey was relatively small compared with the 160 respondents who took part in the Return to Households Survey process.

A5.2 Data on incomes

From the CRMLS Phase 1 survey sample an average wealth estimate for each household was obtained. The value of wealth in this survey is asset rather than income based. This is because it is both sensitive and difficult to obtain data on household incomes (including remittances) over an annual period. Previously, as in the pilot project surveys, qualitative indicators for wealth ("less wealthy, "wealthy", "more wealthy" etc.) were used, based on enumerator observations. To try and obtain a more objective range of data, the asset based analysis is quantitative and is calculated from a head count of livestock (chickens, goats, cattle etc.) and a survey count of capital assets (radios, solar panels, bicycles, carts etc.) taken at each household. These have then been given an monetary value in Z$, equivalent to the farm gate or current market price for that good. The monetary value of each household item used to calculate the value of household assets is presented in Table A4.1. No attempt was made to value remittances as part of the survey process.

Table A1.1 Market (or farm gate) Values Used for the Pricing of Household Assets for the CRMLS Phase 1 survey (1996 Z$ prices; Z$17 = £1).

Description of Asset	Market (or farm gate) Value used (Z$)
Cow	3000
Donkey	550
Goat	150
Chicken	30
Car	50000
Solar Panel	7000
Scotch Cart	2500
Television	1000
Plough	900
Bicycle	900
Radio	200

A5.3 Data on livelihood systems

Most of this data on the group initiatives associated with the productive water point came from the one day combined community garden committee meeting in which representatives from all of the collector well garden committees got together and discussed their experiences of the impacts of the schemes on the community. When asked whether they could identify any possible examples of group, community or co-operative projects that have arisen from the income the collector well gardens have created, the information presented in section 3.3.1 emerged. Most of the data on the individual projects in section 3.3.3 that are associated with the productive water point come from the individual household surveys carried out at site 5 and the Romwe site.

An important concern of the CRMLS survey was the impact of the collector well and community garden schemes on those who didn't join the community garden. To assess the equity of and access or exposure to the opportunities the schemes create for non garden members, an investigation into the impact of the project on non garden member livelihood

strategies was included in the survey design. The aim was to look for evidence of change in the livelihood strategies of non garden members. The results of this analysis are presented in section 3.3.4.

A5.4 Data on the farming systems

The information on the impact of the collector well and community garden schemes on farming systems in the community was gathered at all stages during the CRMLS survey process - individual household surveys, participative group discussions and the gardens' committee meeting, as well as through discussions with local agricultural extension officers and village community workers. It is presented in section 3.4.

A5.5 Other issues raised by non garden members

The CRMLS survey process sought to specifically ask non garden members what they thought the garden members had particularly or especially benefited from as a result of the schemes. Four categories were chosen: the benefits of a reliable water supply, of fresh vegetables, of more money and of "other things". Respondents in the sample were asked to reply yes or no to each category, depending on whether they thought this was a benefit the garden members obtained from the scheme and to expand on any 'other things' they identified. This information is presented in Table 3.8.

A5.6 Natural Resource Management Systems

Most of the information on the impact of the schemes on this systems dynamic came from the participatory group sessions held at the two collector well and community garden sites. These discussions generally provided information on natural resource management problems rather than solutions. This information is presented in section 3.6.

A5.7 The non project sites

One of the objectives of the CRMLS Phase I survey process was to focus on the development and management of water resources in semi-arid production systems in general to identify how they might be used to enhance the dynamics of surrounding production systems. Thus, the CRMLS survey process was designed to compare the pilot project schemes with other water supply points in the region, in order to have some kind of "control" comparison and to at least get a preliminary indication of any key differences in how various types of water points are managed or how they influence surrounding production systems. Time was therefore made available during the fieldwork mission to conduct a survey at a standard borehole with no associated community garden or other project and a brief survey at a dam site which is used to irrigate surrounding vegetable garden co-operatives. These surveys were not suggested in the RD1.

A borehole with no attached community garden or other project.

Participative group work sessions were undertaken and 20 randomly chosen households were surveyed at a NORAD borehole site installed in 1993 at Zvada kraal, near Jerera Growth Point, Zaka District, Masvingo Province. The aim was to compare the experiences and any impacts on production in the surrounding farming systems at another groundwater point with

the data elicited in the CRMLS Phase I survey from the collector well and garden schemes. The NORAD borehole at Zvada is reliable, provides a high yield and has never run dry. The community estimated that 382 households from 6 different kraals use this borehole and the water is used for cooking, washing, brewing beer and brickmaking. Livestock are generally watered at the Chiredzi river. At the NORAD borehole a caretaker system is used to manage the water point. This is a condition set by the donor when boreholes are sunk. The caretaker collects money from the community for grease for the pump (Z$1 from each user/ year), ensures the borehole area is kept clean and goes to the DDF pump minder when the borehole needs repairing. In terms of ownership, the community felt that the borehole "belonged" to DDF. Information from this part of the survey is presented in 3.7.1.

The surface water dam site

Space was also made within the fieldwork for a day in which to conduct a further 4 household surveys with randomly chosen members of one of the Makambe dam vegetable garden co-operatives, again near Jerera growth point, Zaka District, Masvingo Province. The aim here was to try and get a limited feel for some of the issues relating to the potential enhancement for surrounding farming systems from a productive surface water source and its associated vegetable gardens. Information from this part of the survey is presented in section 3.9.2.

A5.8 The water user and institutional sustainability analyses

Having examined the degree to which the productive water points impact on farming, livelihood and natural resource management systems, the next component of the CRMLS Phase 1 survey process was to provide information on who is using the productive water and whether the institutional or management systems which co-ordinate and integrate these associated activities are adequate. The survey process was therefore designed to assess what kinds of management system currently operate at and around the collector wells and farming systems, what kinds of management system are preferable to stakeholders at all levels, and whether the catchment is the best scale at which to operate any kind of management system for the sustainable utilisation of the resource base and production systems. Particular attention was to be given towards ascertaining the potential of community focused strategies that can harness the economic and institutional benefits generated by productive water point and community garden schemes for wider systems management. Information from this part of the survey is presented in 4.2 and 4.3.

The data and information in these sections were obtained at every stage in the CRMLS Phase I survey and consultation process. Consequently, the analysis on stakeholder opinion draws not only from the survey sites and community group meetings but also from regional, national and UK based field staff, practitioners and decision makers.

A5.9 The Willingness To Pay (WTP) Analyses

In earlier pilot project research, WTP surveys were conducted within the context of quantifying some of the key non-market based benefits of the productive water points, ostensibly to clarify the cost-benefit ratio of the project (Waughray *et al.* 1995). However a more practical use of the higher values attached to secure water supplies and income generating projects such as the schemes provide, could be the translation of these WTP figures into pricing systems, marketable property rights or revenue generating systems for managing productive water schemes, run by and for the project communities. In this way the

potential for cost recovery can become more fully realised. Also, other objectives for an economic natural resource management system, such as ensuring sustainability through scarcity pricing or equity through cross-subsidisation measures could be achieved. Related research into identifying methods for eliciting more sensitive WTP values for water is currently being pursued by the Institute of Hydrology. Nethertheless, the CRMLS Phase 1 survey took the investigations into the cost-recovery potential raised by the pilot project WTP studies further by focusing on three main issues. Firstly what user payment systems, if any, are actually in operation at each of the sites? Secondly, and exclusive to non garden member respondents (a different sample population to those surveyed previously), what values for collector well water can be identified at the sites? And thirdly, as a result of the credit channels the project had opened up for some respondents, a series of WTP back loan scenarios were presented and responses recorded.

139 separate bidding games were carried out during the CRMLS field survey to elicit a range of WTP values for issues surrounding the water points and gardens. The analysed sample consisted of 17 garden members, 18 non garden members and 20 non collector well project households. A descriptive statistical analysis and cross tabulation exercises to check the economic stability of these data have been carried out for this report. Further analysis using multivariate models to examine the explanatory variables which may affect the bid curves is planned. The CRMLS Phase 1 survey findings related to each of these issues are presented in section 4.4 on financial sustainability.

A5.10 The WTP back a loan survey

The economic principle justifying the use of WTP or WTA questionnaires or bidding games lies in the desire to quantify the welfare change accruing to an individual that a change in non market benefits (such as a secure water supply or an improved environment) may bring. In theoretical terms this change is expressed through the shifting of an individual's indifference curves, the difference between these curves being measured by the compensating or equivalent variations (expressed as a WTA or WTP) depending on the nature of the welfare change. Thus, these WTP techniques to measure welfare changes are useful where no set of market prices can adequately express the shift of an indifference curve. However, during the CRMLS Phase 1 survey process it became clear that due to the impact of the collector wells on the surrounding production systems, important welfare changes were occurring not only in non market goods such as water supply, but also in a perceived ability to gain access to and cope with credit better. In order to assess whether the schemes had created an increased willingness to apply for credit or loans for further projects, or indeed for a group project like the garden by those who had seen its success, a similar bidding game scenario to the WTP for water survey was used. Although not technically a contingent valuation study as it is not attempting to elicit a value for a non marketable welfare change, the vehicle of a bidding game, to see how much a respondent was WTP per month as a loan repayment on a scheme aimed at improving productivity in the farming system surrounding the productive water point, was seen to be a useful one.

A realistic credit scenario was outlined during these games, including 5 and 10 year pay back horizons and commercial rates of interest. Households seemed to take the survey quite seriously with discussions between family members focusing on the length of time it would take before a stream of benefits would come on line from the new project and comparative risks of getting involved in a group based or a household based loan arrangement.

APPENDIX 2: Objectives, methodology and issues addressed by the workshops

MASVINGO WORKSHOP

COMMUNITY-BASED CATCHMENT MANAGEMENT IN ZIMBABWE

Scoping Workshop: Masvingo 25-26 July 1996

DRAFT PROGRAMME

Wednesday 24 July (For those interested in visiting the Romwe Catchment)

12.00 - 14.00	Check-in at Flamboyant Hotel, Masvingo
14.00 - 18.00	Field Trip to Romwe Catchment
	Welcome by Cncl Mhlanga and Elders
	Meeting with community members
	Tour of instrumented catchment
	Visit collector well garden

Thursday 25 July

8.00 - 8.20	Welcome; purpose of workshop
8.20 - 9.00	Review of ODA / GoZ work to date; the concept of CBCM
9.00 - 9.30	Romwe Catchment Study - Physical Aspects; Practical Findings
9.30 - 10.00	Romwe Catchment Study - Community Needs; Community Enthusiasm
10.00 - 10.30	Tea/Coffee
10.30 - 12.00	Initiatives by other agencies, ongoing and proposed
12.00 - 12.30	Scoping a programme of work - identification of key themes for discussion
12.30 - 14.00	Lunch
14.00 - 18.00	Possible Discussion Themes:

(1) Experiences of Community-Based Resource Management in Zimbabwe
What forms of community-based resource management project exist?
How were these initiatives introduced?
Successes and failures?
How do communities perceive their benefits?
Opinions on the best way to introduce such initiatives?
What are the ingredients needed to achieve community-based resource management?

(2) Community-Based Catchment Management in Zimbabwe
How important is scale to the success of community-based management?
Is "community" an appropriate concept and best social group with which to work?
Is "catchment" an appropriate concept and best scale at which to manage?
Do water development projects provide an entry point for wider environmental initiatives?
Is there demand from communities for further initiatives of this type?

Is there evidence of a springboard effect with one project leading to another?
Which organisations should be involved and which steps should be followed?

(3) Needs and priorities to achieve community resource management in Zimbabwe
List all that could be done
Prioritise as far as possible
Broad headings might include:
Small catchment studies in different settings
Identification of social, economic & institutional constraints to local resource management
Policy issues for CBRM and CBCM
Development of extension materials and training programmes
Community training programmes
Livestock
Forestry
Crop Production
Irrigation
Environmental Health
Credit / Income Generation
Downstream Effects of Catchment Management
Modelling

Friday 26th July

08.30 - 12.30 Towards a Logical Framework for the Programme of Work
Define goal and purpose
Prioritise list of outputs and activities
Identify the role and contribution of collaborating organisations
Recommend key people to work on different aspects of the proposal
Form steering committee or institutional framework for the programme
List actions and responsibilities

12.30 - 12.45 Close of Workshop

12.45 - 14.00 Lunch

TRIANGLE WORKSHOP

Zimbabwe Community-Based Resource Management (CBRM) Meeting
6-8 November 1996
Triangle

Background and purpose of meeting

Since 1989 a programme of UK ODA funded research and development projects have investigated methodologies for the development of communally managed water points and gardens in South-East Zimbabwe. A programme of 100 such schemes (the NGADI project) is planned in Masvingo province starting in 1997. A major component of this programme will be the development, by the participating communities, of environmental management plans for each scheme. Further details of the projects are contained in the progress and final reports, copies of which will be available at the workshop.

A hypothesis has been formed that development of a first water project makes an ideal entry point to work with communities on wider issues of Community Resource Management and Livelihood Strategies, working in key areas such as livestock management, soil and water conservation etc. The UK ODA have agreed to fund a three month investigation of this hypothesis with the aim of collecting enough data and informed opinion to verify or reject it.

The investigation will take the form of six weeks of fieldwork, to assess the impact of the nine community water points and community gardens (seven implemented under previous UK ODA projects and two funded by Plan International) on:

a) the wider farming systems as practised by participating communities;
b) the value placed on community-based water projects by participating communities
c) the attitudes to and interest of communities in developing and implementing wider community-based resource management schemes

This fieldwork aims to supplement and complement the information and data collected from monitoring these schemes during the last six years. The six weeks of fieldwork will be followed by two meetings (one in Zimbabwe and one in the UK) at which the findings of the fieldwork will be presented. The views and comments of the participants at these meetings will form an integral part of the investigations.

The product of the investigation and process of consultation will be a report that; details the impact of existing community-based water points and gardens in south-east Zimbabwe; makes recommendations on whether a three year pilot programme of research into community-based resource management to run parallel to and feed into the NGADI project is warranted; and, if it is; the form this research should take.

Specific objectives of the meeting

i) To report, discuss and build on the recommendations of a workshop that was held in Masvingo at the end of July. This meeting was funded by the ODA Engineering Division as an end of project workshop for a project that has been looking at the effects of land management on groundwater recharge in the Romwe Catchment. A major part of this workshop was a scoping exercise on community-based resource management;

ii) To hear and discuss the results of the long-term monitoring of the community-based water points and gardens and the results of the six-week programme of socio-economic evaluation carried out as part of this investigation of CBRM;

iii) To discuss the main constraints on community-based management of resources at the village level and to discuss whether rural development processes involving facilitators and/ or other interventions are needed to overcome these constraints;

iv) The workshops will assess the evidence that the best scale at which to carry out community resource management is the small catchment and will decide whether this hypothesis is valid, or whether other scales of intervention are more appropriate;

v) To discuss the frameworks by which village level community -based resource management programmes can be reconciled with programmes aimed at improving resource management and reducing environmental degradation at a river basin scale;

vi) If the workshop identifies a clear need for a research project to address issues in implementing community-based resource management, an outline logical framework for a three-year research project will be drafted.

A parallel meeting at the same venue, involving hydrologists and modellers from Zimbabwe, South Africa, and the UK, will be carrying out practical work on the development of catchment models. By holding these meetings in parallel, it is hoped that there will be a good interaction (both formal and informal) between participants at each meeting and that this interaction will lead both to improvements in the catchment models and a better awareness of the role that catchment modelling could play in developing resource management policy and programmes.

TRIANGLE WORKSHOP AGENDA

Wednesday, 6 November

12.00 - 14.00	Registration and Lunch
14.00 - 14.30	Welcome, introduction and participants introduce themselves
14.30 - 15.45	First session: Discussion of main findings of Collector Well Project and work to date on Community-Based Resource Management (CBRM) in south-east Zimbabwe and elsewhere
15.45 - 16.15	Tea
16.15 - 17.30	Second session: Discussion of report from Masvingo workshop and general discussion on the potential for CBCM, the constraints on CBCM, and the development strategies and processes that might lead to successful implementation of CBCM.
17.30 - 18.00	Third session: Discussion of findings presented
19.00	Barbeque with modelling meeting participants

Thursday, 7 November

08.30 - 10.00	Fourth session: Discussion of social, economic and institutional impacts of a first community-based water project or similar development
10.00 - 10.30	Coffee
10.30 - 12.00	Fifth session: Discussion on data and experiences that provide evidence that a first community-based water scheme or other development may provide an opportunity for initiating CBRM
12.00 - 14.00	Lunch
14.00 - 15.30	Sixth session: Discussion on strategies, policies, subsidies and legal frameworks that may facilitate CBRM
15.30 - 16.00	Tea
16.00 - 18.00	Joint session with participants of the modelling workshop

Friday, 8 November

08.00 - 08.30	Explanation of scoping exercise and how to construct project logical frameworks
08.30 - 12.00	Break into 3 small groups to work on the logical framework. Key themes to be addressed are: Project Goal, Purpose, Outputs and Activities Project Management Structure and Boundary
12.00 - 14.00	Lunch
14.00 - 15.30	Each group reports back on its logical framework (3 x 30 minutes each)
15.30 - 16.00	Synthesis of individual logical frameworks to come up with definitive version
16.00 - 16.30	Tea
16.30 - 17.30	Summary of the three days work and discussion of future direction.
17.30	Departure for those living near by. Others to leave morning of Saturday, 10 November

APPENDIX 3: Experience in community-based resource management in Zimbabwe with special reference to the pilot collector well garden schemes

by Dr Fanuel Nangati, Social Development Adviser to CRMLS Phase I

INTRODUCTION

Community management of natural resources has become a highly fashionable term. However, putting it into practice is not easy as the experience in Zimbabwe discussed here shows. At the very least, a viable community-based management of natural resources involves an appreciation that people or community needs are a priority.

The underlying causes of natural resources over-exploitation and environmental degradation are mainly social, economic and institutional in origins. This means that the primary concern of community-based resource management should address the relationship between human welfare and a particular resource and its conservation for the use of future generations. The conservation of natural resources has to be linked to human welfare as the major motive force for resource conservation.

The basic social requirement is that the operative unit, the producer/user community should be small enough for households to participate meaningfully in the programme. The question of scale is critical for community cohesion. The smallest social organisation above the household - the village community - should be able to "meet under the indaba tree" to decide management issues, as was customary in traditional open governance. If a community is too large or too dispersed for free discourse between members, it is preferable that it divides into smaller entities, each of which is then represented by a co-ordinating body.

The economic requirement is that the producer/user community must benefit from their labour through the sale of their produce. This economic incentive provides the most important rationale for conserving the resource. The institutional requirements are:

a) security of tenure for specific user groups;

b) use of regulations evolved and enforced locally; and

c) development and investment or conservation and growth/expansion of the resource in question.

These three basic requirements of community-based resource management will feature throughout the following discussion.

THE ZIMBABWE EXPERIENCE

The experience in community-based management of natural resources in Zimbabwe is relatively recent and initially involved wildlife (1989) and fish (1991). Nevertheless, useful lessons have been learnt which constitute an invaluable experience. The following is a summary of what is known about community-based management of natural resources in the communal areas of Zimbabwe.

1. Producers/users, Managers and beneficiaries should be the same people

   The group of people who benefit from the primary use of a resource should be held fully responsible for managing it properly. This implies full proprietorship of the resource by land holders, with "ownership" or user rights at such a social level as is culturally appropriate.

2. The User Group should be small enough for households to participate in the Programme

   Scale is critical to community cohesion. The whole community should be able to meet under the "indaba tree" to decide management issues as was customary in traditional open governance. If a community is too large or too dispersed for free discourse between members it is preferable that it divides into smaller entities each of which is then represented by a co-ordinating body.

3. A body representing a community should be accountable

   Any body set up by a community to undertake a function for it should report back regularly to its constituency. These reports are, in effect, to the shareholders/ stakeholders in a common venture and should be easily understood by all concerned.

   This informal report back may be strengthened by registering the membership of the community and indicating who is eligible to use and benefit from the use of particular resources and thus accountable for their protection from abuse.

4. Functions should be devolved to the lowest level of social organisation at which they can be performed properly.

   Whenever possible, responsibility for natural resources should be devolved to the producer/user community. Only if the producer/user group cannot perform a function should it be devolved to a higher level of governance.

5. There must be a close link between production and benefits

   The revenue earned by the community should be retained by it. In practice, a small service charge may be raised by central or local government that support the revenue generation especially in the case of wildlife and fish, but this must represent fair payment for inputs of real value to the producers or users of a resource.

6. Producer/User communities must be able to allocate or spend their earnings as they see fit.
   The households of the producer/user community should be able to use their income as they wish. This includes how much will be spent on managing the resource or for community or individual projects.

7. Communities should not over-extend themselves

Communities should not embark on activities or investments that they cannot sustain without outside help. Living within their means might slow progress, but it builds on its own capacity to maintain itself. It avoids the problem of donor or government dependence and the creation of elaborate institutions that can easily absorb most of the benefits generated by the use of natural resources so that they can no longer complete with other land uses.

8. Developing community management skills and systems

The evolving of local management systems and the skills to implement them, is a process that should be encouraged without coercion. Building up trust helps overcome rural people's dependence on the state.

Devolution of authority over common resources will succeed only if the legal and economic setting is conducive to success. It also requires technical support ranging from how to set resource use limits for users. Such issues need not be complex and beyond the capacity of rural communities to implement, even where the level of literacy is low.

9. Government is the ultimate authority for natural resources

There is no contradiction between government or local authority being the ultimate authority for natural resources and devolving the responsibility to manage it to local communities. The people on the land are in the best position to manage it efficiently and should be encouraged to do so, while government or local authority monitors the process to ensure that it is sustainable. This is feasible, provided responsibility is devolved to the grassroots - making the system more accountable and less prone to abuse - and the people are committed to supplying the records needed in support of monitoring the resource to guard against over use and ensuring that producer/user does benefit; without this incentive the resource may not last.

10. Community-Based Natural Resource Management Represents Cooperation Between Local Communities and Government, with Government Playing a Special Role

Some government actions are achieved by passing directives down from Government to the people on the ground. Others need to be achieved through a partnership between government and organisations that represent grass-roots stakeholders. Successful community-based resource management falls into the latter category, with the state devolving its authority over resources to communities who become proprietors. Government can no longer issue directives or enforce their compliance, so long as the proprietors manage the resource properly and conform with any agreement to do so.

The role of government shifts from a director to the facilitator of sound management, through the provision of information and other support services like research and extension.

In effect, the state trades power for influence; a police force fr an extension worker in a field where policing has been expensive and ineffective. This is because resource

management is now driven by institutionalised personal and group incentives, rather than attempts to enforce flawed and socially unacceptable legislation.

LESSONS FROM THE CAMPFIRE EXPERIENCE IN COMMUNITY-BASED MANAGEMENT OF NATURAL RESOURCES

Much of the above lessons are drawn from the experience of community management of wildlife - the Campfire Programme. This may be extended by highlighting its inception and specific features.

The Communal Areas Management Programme for Indigenous Resources (Campfire) was a programme designed to allocate the rights to use communal resources, especially wildlife, to small communities, providing an incentive to use the resources in a sustainable manner.

Having determined what should be done technically, it was clear that new socio-economic institutions were essential and would have to be created in order to achieve management objectives. The programme needed to be acceptable to participants from different cultures, under different ecological and economic circumstances, and to conform with government policy. In addition, it was recognised that it was necessary to generate sufficient incentives to promote good conservation and to create disincentives to inhibit abuse of the resources. Improved returns were needed to cover the costs of the new institutions, leaving enough over to provide a strong incentive to rightholders to invest in the conservation and development of their resources.

It was preferable that sanctions for the misuse of the shared resource base should be through local pressures. Campfire aimed to internalise the costs and benefits of resource management to the individuals in defined communities, removing externalities and systems of open access that characterise and plague communal resource management.

The existing rights of any resident of communal area to use the common property resources where a serious complaint against the implementation of Campfire. It negated the ability of a community to allocate the resources in its area exclusively to its members, so that resources would be managed better. The problem was solved through a directive from the President when communal areas were divided into administrative units of villages and wards, which were given control over the resources of their respective subdivisions in 1989. In the same year, Appropriate Authority status for rural communities to manage and benefit from their wildlife resources was given to the first Campfire Rural District, Nyaminyami and many others subsequently applied and obtained this authority.

Progress leading up to and including the implementation of Campfire was greatly accelerated by having a set of broad objectives which could be refined as experience was gained. Such objectives enabled the implementing agency, the Department of National Parks and Wildlife Management and its partners to exploit chance situations as they arose, especially during the fluid situation that accompanied independence. The more flexible bureaucracy and greater political emphasis on the devolution of authority to the "grass-roots" favoured the emergence of a local brand of community-based wildlife resource management.

The new political possibilities coupled with the rapidly growing economic importance of wildlife were powerful catalysts in favour of Campfire. The third vital ingredient for progress was the coming together of organisations with individuals of varied but complementary expertise - ecologists, economists, social scientists, social workers and politicians - from both the public and private sectors, the University of Zimbabwe, NGOs and

remote rural communities. All these worked in an alliance with the common purpose of advancing the Campfire concept.

IMPLEMENTATION AND RESULTS

Within the first two to three years of implementing Campfire, poaching and related convictions for illegal hunting declined sharply. For instance, in Mahenye convictions declined from 80 to 10 within a period of two weeks.(1) Campfire spread rapidly within 4 years of its inception. By 1993, it covered 70 wards in 12 districts.(2) This involved some 68 800 households representing 500 000 people or 5.5% of the total national population benefiting from wildlife. These benefits derived mainly from safari hunting with wildlife tourism beginning to emerge in a few prime sites and might have doubled if it was not for the ban of ivory trade.

Benefits from wildlife revenue rose from $7 861 in 1989 to $68 798 by 1993. The costs for managing Campfire first increased and then remained at around 20% while the revenue earned by communities improved from 37% in 1990 to 63% in 1993. The funds managed by local communities rose from 14% in 1990 to 75% in 1993.(3)

The programme has had the full support of the two key government agents, the Department of National Parks and Wildlife Management and the Ministry of Local Government. Three NGOs also helped facilitate the programme. Zimbabwe Trust assisted in its implementation in respect of institutional development. The local World Wildlife Fund (WWF) provided ecological and economic advice and the Centre for Applied Social Sciences, University of Zimbabwe, monitored socio-economic progress.

The Programme has subsequently seen the emergence of the representative Campfire Association, involvement of rural communities and the support of elected leaders. The long-term success of the programme will not be measured in monetary terms, but by functional people-participation in securing the resource and people's long-term future.

Campfire offers a solution to the management of natural resources in arid and semi-arid lands with wildlife and other resources, with respect to community managed resources at the national level, but the programme is still young and there is need to improve the following:

1. consolidate the devolution of responsibility for wildlife and other renewable resources to the household level;

2. continue to strengthen the inherent institutional capacities for developing and managing the resources at this level; and

3. ensure that the revenues generated are managed carefully to ensure proper accountability.

It is also important that the management of the resources, by the community, continue to be emphasised and not eroded by encouraging communities to monitor their wildlife populations and determine the annual harvest.

THE GOZ/ODA COLLECTOR WELL GARDEN SCHEMES

Small scale irrigation using collector wells has been experimented upon in the south-east of Zimbabwe, Masvingo Province, since 1992. This is a Government of Zimbabwe (GOZ)/British Overseas Development Administration (ODA) Project.

Masvingo Province is one of the driest parts of Zimbabwe where scarcity of water is a major constraint to rural development. The pilot phase of the project has offered an opportunity to assess the impact of a specific intervention which aims at enhancing the livelihood strategies of the poor in marginal rural communal lands. In particular, the project allows for an assessment of social, economic, institutional and environmental issues related to community-based management of common resources.

The introduction of the collector well (CW) to access ground water resources is a significant advance to the conventional strategy of improving conservation of scarce surface water supplies in arid and semi-arid lands (ASALs). This new technology has the potential to complement existing rainfall farming systems, initiate additional non-farm livelihood strategies and slow down land degradation, albeit on a small scale.

The undoubted strength of the collector well technology is the provision of a reliable source of water which can be put to a variety of uses. In addition, it provides cleaner water and thus improves the health of the local population, especially the more vulnerable children. Furthermore, the attached vegetable garden has a positive impact on the health of the community in general through a constant supply of vegetables. The CW garden has also proved to be an important source of revenue obtained through the sale of vegetables. Thus the collector well is of utility, economic and social value to the community: cleaner water and food/nutrition from the attached garden, income from the sale of garden produce and collective interaction focused on gardening and other related activities, e.g. women's clubs.

IMPLEMENTATION AND RESULTS

The establishment of these schemes has been achieved, as in the case of the Campfire programme, with sufficient flexibility to allow for situational differences at each site and learning from experience. For example, CW garden membership was determined by communities and varies from 50 - 130 in the 6 pilot CW garden schemes.

There has been community involvement at all stages of the project from inception, through planning and construction to subsequent maintenance and management. An interdisciplinary project team was involved to ensure that schemes are socially sustainable. An example of this was ensuring an informal community contract prior to well construction which was a potent means of spelling out obligations, clarifying misconceptions and creating a sense of ownership from the start.

The final and annual reports on the pilot phase have extensively documented positive benefits in the development of community gardens using ground-water. These are improved productivity due to better nutrition, reduced demands on women's time and energy spent fetching water and in providing relish, the provision of employment at the local level, development of collective action and strengthening of local level institutional structures. This offers a possible way in which communities in marginal lands threatened by land degradation and poverty can stabilise or improve their living standards and quality of life. More recently, research has been conducted using participatory methods to try ad establish possibilities offered by productive water points (CW gardens) in further strengthening

existing and new livelihoods strategies. Preliminary results have shown that income from the sale of garden produce is comparable and can even be better than the wages earned by workers in the sugar estates in Masvingo Province.(4) With this income, members of the CW garden are able to purchase food and other household necessities, pay school fees, hire labour during peak agricultural periods, buy farm inputs and engage in rabbitry, keeping goats, pigs and cattle fattening.

Interestingly, there is also evidence of CW and garden impact on natural resource management strategies in the surrounding areas. This information came from participatory group sessions. The environmental problems mentioned included over grazing of existing pastures, tree felling and opening up of marginal lands. As the result of increased level of agriculture extension services at the well sites, people are becoming more responsive to the need to conserve soil and water. Conservation activities are being initiated at and around the project sites by individuals, extension staff and traditional leaders.

Generally, this is being done through the extension workers who turn to kraal heads to either mobilise people and/or enforce penalties through the imposition of fines.

These natural resources management (NRM) structures or committees work in parallel to the CW garden committees. Sometimes there is an overlap, as some members of the CW garden committee also serve on the NRM committee. The NRM committee is generally considered adequate in handling environmental issues in the locality although people recognise that environmental management problems still exist.

THE CHALLENGE OF PROJECT SUSTAINABILITY: AGENDA FOR APPLIED SOCIAL RESEARCH

While the pilot phase of the CW project has proved its worth in terms of utility, economic and social values, it is however more important that these community CW garden schemes become sustainable in social, economic, institutional and environmental terms. Although some steps have already been taken in this direction, further attention will be required on the issues highlighted below in the next phase of research to support the efforts on community-based small scale irrigation using collector wells such as the proposed NGADI Project.

What would be extremely valuable is to have a pilot district in Masvingo Province where research can be conducted on three sites/communities while continuing to monitor developments at one of the pilot sites, e.g. the Romwe CW project in Chivi, as the fourth site. Ideally, research on community-based resource management should be focused in rural areas which are neither state owned (state farms) nor privately owned (commercial farms). Such is the case with communal and resettlement areas. The chosen pilot district could have two sites in a communal area/s and one in a resettlement area. These are the most appropriate areas for community-based resource management: they are marginal, most degraded, densely populated and therefore representative of rural communities in the country. Further, land tenure in these areas is characterised by common user rights and therefore suitable for community-based resource management strategies.

Below are outlined issues that need further inquiry through applied social research and with the intention of enhancing the sustainability of community-based management of CW garden schemes.

1. Use of local/traditional knowledge to supplement scientific information.

There is need for a greater understanding of the communities' knowledge of their natural resources and the constraints they face. It is important to know what these resources are, how they are used, when and by who?

Such knowledge will assist in identifying incentives for natural resources management. When properly consulted, communities can be invaluable "instruments" for identifying location of underground water sources which can be tested for feasibility using modern technology and such knowledge can also be suggestive of how best to restore or conserve the degraded resources.

This information can be obtained through baseline resource use surveys and group participatory sessions with key informants, extension workers and community members with due regard for gender variation. The communities' accumulated knowledge can also supplement scientific information in monitoring and improving the overall management of resources.

2. Conflict and Conflict Resolution

There is need to understand processes and mechanisms of conflict resolution in the communities and project committees. Conflict is an important and integral part of community-based management of natural resources. It often arises over resource allocation and in effect, it needs to be understood that conflict is an inherent factor in any cooperative endeavour, including a household. What is at stake or important to know is how to develop conflict resolution mechanisms for project management committees.

One way to do this is to include facilitators as non-voting members - e.g. village community workers or other extension staff and/or traditional leaders such as kraal heads who can sit in committees as ex-officio members.

In fact, the origin and function of a kraal or village headman are misunderstood by both government and NGOs who operate in rural communal areas. A village headman is a leader of the dominant clan in the village much like the chief in a particular area or rural district. Village headmanship is inherited through the rules of seniority of the clan in question. He functions as the head of a village and is highly respected by the majority of clan followers and the minority of villagers not belonging to the dominant clan in the village.

It is this legitimacy and the respect accorded to him that he traditionally allocates land in "his village", presides over the village court and generally enforces village regulations through the sanction of tradition. Governments, past and present, have tended to manipulate traditional leadership or weaken it for interests of little or no relevance to village welfare.

In communal areas, development agents and government alike fail to exploit the potential value of traditional leadership in facilitating the development process. For instance, allocation of a plot in the CW garden to the village headman may facilitate smooth operations and discipline in the project.

3. Enforcement of Resource Management Regulations

External impositions of regulations pertaining to community resource use has proved expensive and difficult and tends to encourage illegal use of the resource. The

management/control of natural resource is more effective when enforced by those who introduce it - resource users or producers, not only through formal means of control but also through social sanctions imposed by tradition.

Traditional leaders and elders are the custodians of social sanctions and any programme or project that ignores this tends to suffer the fate of top-down approaches epitomised by the failure of the Mid-Zambezi Valley Resettlement Project.(5) For applied research, the lesson is that decision making processes in the community need to be studied together with the identification of the existing and viable community structures. Such structures too, are critical to the decision making processes involved in the establishment and implementation of programmes and projects.

4. Security of Tenure

Research needs to look into socially acceptable ways of securing land for CW garden schemes to minimise conflicts that sometimes surrounds a piece of land acquired or "donated" for group use. Experience in the pilot phase of the CW garden schemes shows that security of tenure is enhanced where the scheme is situated on land which was not used by a particular household like arable land, but was used by the local community as a whole such as part of its grazing land.

The Romwe CW garden scheme in Chivi is an instructive case where the community refused to use donated land for the CW garden and opted for part of community grounds used for playing by children. Other ways may be explored such as securing land for a project through the Rural District Council's Land Allocation Committee or getting the RDC to take steps to gazette a defined piece of land for the purpose. Research on this issue could indicate community preference on obtaining more secure land for locating CW gardens.

5. Equity and Membership

The question of fairness in the distribution of benefits of the CW garden needs further investigation. Baseline surveys on household productive assets can be used to get information on establishing the poorer households in the community. Participatory group sessions can be used for allowing the community to debate the issue and come to some conclusion of how best people can ensure equity in garden membership and guarantee social sustainability of projects. Information can also be collected on the dominant clan in the community as well as minority members of other clans. The clue to identifying the dominant clans in communal areas is to know the clan of the village headman and then establish how many of the same clan are in the village.

In the pilot phase, the question of equity has not been a problem, on average 49% of CW garden members have been found to be the poorer households in the communities. The involvement of women too was not problematic due to the fact that gardening is normally the function of women in the traditional household division of labour.

6. Mobility in the CW Garden Schemes

CW gardens as community projects should not be conceived as closed systems. This may be viewed by the larger community as unjust. In some projects elsewhere in the

country where this has occurred, those outside the scheme have vandalised equipment, removed or damaged the fence in protest against exclusion. Research should seek to establish strategies that allow movement in and out of the schemes. Communities may, for instance, formulate regulations or by-laws that allow abandoned garden plots to be re-allocated to those on the waiting list. Rules could be made indicating whether a garden plot is inheritable and how.

Transparency, especially in the eyes of non-members of a garden scheme is an important aspect in the management of a community resource so that the scheme is not associated with particular people or section of a community.

7. Institutional Development and Support

The CW garden communities need the support of institutions at higher level of ward and rural district council. There is need for a comprehensive study of how rural district councils can support committees at village level. CW garden committees cannot exist in isolation and survive. There is therefore need for constant support from the Rural District Council and government district level extension personnel - Agritex, DDF and other extension workers to assist in conflict resolution and technical hitches as facilitators.

Another support needed but often neglected is proper consultation with traditional leaders in their capacity as "owners of the land". The participation of village headmen, sub-chiefs and chiefs appears to be either indirect or wanting in the pilot CW projects. In similar contexts, it has been observed that "if you win these over, it helps because they are always present and have the legitimacy which councillors and other modern leaders do not have".(6)

Working with modern leaders regardless of the common latent tension between them in many parts of the country is limiting. The participation of traditional leaders is crucial for effective law enforcement in communal areas. Effective control requires, in addition, informal sanctions imposed by tradition. For instance, in small irrigation schemes in Manicaland Province, the participation of traditional leaders is institutionalised by the allocation of a piece of land in the schemes to ensure their presence and, by extension, discipline made possible by the inclusion of a village headman, sub-chief or chief in the scheme.(7)

8. Capacity Building

The leadership problems that have been experienced by some CW garden schemes indicate the need for basic training in how community organisations should operate since the CW is meant to benefit the communities surrounding the water point and not just a few who are in the garden committee itself. The problem appears to be that of who is to provide this training? A study of the structures and functions of RDCs might assist in clarifying this question. Ideally, the CW garden communities should have both members and non-members to allow wider discussions of issues other than those of the CW garden, those that concern the interests of the wider community, for example, the management of the CW catchment area. Capacity building is further necessitated by the fact that the majority of garden membership are women whose educational opportunities have bee limited historically and culturally.

9. Long-term Maintenance of CW

Evidence from the pilot phase shows that CW garden committees are not prepared for the increased costs of maintenance as the CW gets older and more expensive to maintain. The fees charged for garden membership and access to water from the CW may be adequate for the current relatively less costly repairs. However, as maintenance costs increase, communities might consider more regular charges for both members and non-members and with a different fee structure for the two groups. These charges could be subject to quarterly review depending on costs incurred. Continued monitoring of at least one of the pilot CWs could provide information on long-term trends in maintenance costs from which a strategy could be devised for committees to build up their financial resources in order to ensure sustainability of the well.

10. Developing Natural Resources Management Systems

The sustainability of CW and garden will depend on the management of natural resources in the related catchment area. This task is clearly beyond the ability of CW garden committees which, as we have seen, are mainly composed of women.

Such a task will require the broadening of the committees to include the participation of non-members. Further, this will also require the support of both modern and traditional leaders and that of the extension personnel in the communities.

The incentives or specific environmental benefits of community gardens using ground water include the reduction in pressure to cultivate marginal lands, particularly streambanks and the promotion of long-term management strategies due to decreased risk and increased security of tenure that the schemes bring. Thus, community participation in the development of small-scale irrigation using ground water can have the benefit of providing a springboard to improved resource management at the village or catchment scale. This gives rural communities their first experience of the institutions needed to make community-based activities successful. The future development of wells and gardens should go hand-in-hand with programmes of community-based natural resource management, building on the opportunity and incentives that this type of water development provides.

11. Enabling Policies

Currently there are proposals for policies, strategies and programmes being formulated at national level in Zimbabwe which have a bearing on community-based resource management in communal areas. Below we outlined the main thrust of some of these.

THE NATIONAL WATER RESOURCES MANAGEMENT STRATEGY (WRMS)

This strategy seeks to rationalise the distribution of surface water and change colonial laws which allowed individuals, groups or companies to have exclusive access to water from dams, lakes and weirs at the expense of their neighbours in communal lands. There are some dams which are located in communal areas but because water rights are exclusively for commercial agriculture, the rural poor cannot have access to this water. The anticipated change in water permits would allow the rural poor to use the water for both domestic use and small-scale irrigation.

NATIONAL POLICY AND PROGRAMME ON DROUGHT MANAGEMENT IN ZIMBABWE

This is being formulated to supercede the Civil Protection Act (CPA) of 1988 whose weaknesses will be avoided by applying three basic principles:

a) enhancing peoples participation in developing their adaptive strategies, indigenous knowledge and individual, family and community coping mechanisms;

b) clear responsibility and empowerment at all levels and community determination of interventions based upon informed decision making; and

c) emergency assistance shall be avoided in all instances and when one is necessitated, it should sub-serve the goals of development.

These principles are consistent with the basic themes of participation, empowerment and responsibility as detailed in the general macro-policies of Zimbabwe. The policy will also provide some guidelines reflecting the reality of limited resources for emergency relief.

One of the major objectives of the policy is that emergency assistance effort shall reinforce the capabilities of the affected population while promoting self-reliance, eliminating the root causes of vulnerability to droughts and contributing to sustainable economic development and growth. Four policy principles are proposed; popular participation, setting of priorities, decentralisation of drought management and the emergency-development continuum. The last principle of policy direction proposes a situation where emergency assistance is aimed at effecting development and that this development be sustainable so that emergency assistance is decreased and eventually eliminated.

PROGRAMME OF LAND REDISTRIBUTION AND RESETTLEMENT

This is a long-standing a programme which began soon after independence in 1980. The intention then was to find land and resettle 65 000 landless families. The programme faced many constraints including shortage of funds to purchase land and qualified personnel to undertake land use planning.
To date, less than the targeted figure of the families in need of land have been resettled and the number of the landless has increased and far exceeds the original figure of 65 000 families. Funds for the purchase of land still remains a major problem. Government has however resorted to acquiring land through designation and some families are being resettled in all the 8 provinces of Zimbabwe. However, since land is limited, it is recognised that other ways for people to earn a living need to be found such as employment generation and increasing productivity in communal areas through more intensive methods of agricultural production including small scale irrigation schemes such as CW gardens.

Related to the issue of land was the Land Tenure Commission set up in 1993 to look into the appropriateness of land tenure systems in Zimbabwe.(8) The recommendations of the Commission on communal lands are relevant to the development of sustainable livelihood strategies in communal areas.

For instance, the Commission noted that environmental legislation is fragmented and that it puts greater emphasis on controls than providing appropriate incentives for sustainable resource use and encouraging communities to develop their own management solutions. Further, the Commission observed that there has been no comprehensive approach to

sustainable development or concerted effort to find suitable alternative income-earning opportunities to retard the conversion of woodland, range land and other marginal lands to cropping land or promote sustainability.

The Commission recommended appropriate economic incentives to promote investment in environmental management, education and research in natural resource utilisation and development of appropriate institutions with adequate representation of women - who constitute 70% of farmers in communal areas. In conclusion, the commission pointed out that there is need for an integrated policy framework for promoting land and natural resources management.

The policy changes discussed above focus on the need to promote or enhance sustainable livelihood strategies in the communal lands of Zimbabwe. The small-scale irrigation using Collector Wells Project answers this call. Information that can be gathered through research on community-based CW garden schemes is needed in the formulation of an appropriate policy framework for rural development or alternative strategies to rural development in the dry and marginal lands of Zimbabwe.

CONCLUSION

Rural development in tropical Africa is at a cross-roads. Development programmes engineered from "above" have lasted as long as the programmes themselves. Large-scale ambitions projects using expensive technology and complex management structures have also had the same fate. Both government and NGOs are beginning to realise the limits of externally driven "development" in rural areas. The simple fact is that these do not last.

Evidence is beginning to emerge that demand-driven small projects which are identified, planned, implemented, monitored and evaluated with and by the communities stand a better chance of success. These are small, manageable and controlled by the communities themselves, using and building on their own local knowledge, resources and skills. Such projects require supportive policies and facilitative inputs while being driven internally, step by step, and not subject to the regime of mechanical logframes and artificially contrived target outputs.

In Zimbabwe, attempts at community-based management of natural resources began in the late 1980s with the introduction of the Campfire programme focused on sustainable utilisation of wildlife in arid and semi-arid lands where agriculture is marginal. However, with time, demands from the grassroots for the application of the Campfire principles to other natural resources have seen the gradual application of these principles to other natural resources such as timber, fish and water. These developments need to be extended and studied and not patronised.

Attempts to enhance existing livelihood strategies in marginal lands in response to the specific needs of the communities are showing promise for success. Such projects are needed and research is necessary to understand related community dynamics to further enhance this development.

FOOTNOTES

1. Child, G., Wildlife and People, The Wisdom Foundation, New York, 1995, p. 171
2. Ibid.
3. Ibid., p. 172
4. Government of Zimbabwe/British Overseas Development Administration Publication, Collector Well Garden Performance 1995 Winter Season, p. 20.

5. Derman, W., 'The Unsettling of the Mid-Zambezi Valley, Unpublished, CASS, University of Zimbabwe, 1990.
6. ALCOM News, Issue No.19, July, 1995, A Publication of the Aquaculture for Local Community Development Programme, p.5.
7. Nangati, F., Social and Environmental Health Parameters in the Planning and Management of Small-scale Irrigation Schemes, AGRITEX/EUROCONSULT, 1993.,
8. Zimbabwe Farmers' Union, Land Tenure Systems in Zimbabwe, Published by Fredrick Ebert Foundation, 1995, pp. 21 - 29.

APPENDIX 4: Findings and Recommendations of the Land Tenure Commission

LAND TENURE AND IMPLICATIONS FOR NATURAL RESOURCE AND ENVIRONMENTAL MANAGEMENT

The major environmental problems.....are largely a result of inappropriate farming systems and over-exploitation of inadequate environmental resources for short term gains mainly due to adverse socio-economic circumstances of the majority of farmers (and the rural population at large).

Natural resource policy, therefore, must address not only regulatory legislation, but also the development of sustainable farming systems for various tenure systems.

There is also a need to provide farmers in all sectors of agriculture with appropriate environmental management tools. Such tools should include imparting of skills and creating the right economic incentives, support systems and information to enhance agricultural production.

The report helps to:

- specify policy and institutional constraints in natural resource conservation and environmental management;
- suggest the economic, educational and institutional considerations to be taken into account in the design of an appropriate policy framework for the management of natural resources in Zimbabwe;
- employ these basic considerations in developing an outline of an administrative structure for managing natural resources at the national, provincial/rural district and community levels.

Addressing the root causes of environmental problems

The report concludes:

The principal causes of environmental problems are institutional - simply put, it is lack of access to and control over resources (eg. water)

There is the dependence of a growing population on a restrictive agricultural enterprise structure and the lack of alternatives (non-farm related incomes)

A related factor is the lack of clarity with respect to property rights. This results in resource conflicts, for example, over woodlands and grazing land with respect to private and state lands.

It appears that even the water problems in communal areas of Zimbabwe is one of access and security, rather than of quantity. In addition, where such conflicts exist, people are less likely to invest in conservation.

Planning for resource management initiatives has proven difficult within the constraints of the administrative structure of the VIDCO because boundary disputes abound when resource areas are artificially demarcated to fit an administratively defined user group (systems boundaries).

Policy Issues and Constraints

Most legislative and organisational apparatus pertaining to the environment thus far place greater emphasis on controls and centrally-derived messages, than on providing appropriate incentives for sustainable resource use and encouraging communities to develop their own management solutions

There has been no comprehensive approach to sustainable development nor has there been a concerted effort to find suitable alternative income-earning opportunities to retard the conversion of woodlands, range land, and other marginal lands to cropping land or promote sustainability.

Economic incentives/Investment needs

There is a need for investments in technology and research to increase production in low potential areas and minimise environmental pressures. There is also a need for financial incentives for investment in environmental sustainability.

- investment in developing alternative technologies
- investment in information and extension services on natural resources management and opportunities
- incentives for natural resource conservation, regeneration and efficient use and alternative rural industries

Education/Research needs

- holistic analysis of large scale trends and effects
- analysis of long term processes of rangeland change
- study of the impact of freehold tenure on natural resource management
- analysis of the economic potentials of different farming systems and initiatives
- scope of indigenous woodlands regeneration
- potential of harnessing indigenous knowledge, customary regulations and management practices
- studies of water resource utilisation
- environmental assessments of various developments, technologies, land uses etc.

Institutional/Administrative needs

The institutions designed at the national, regional and local level are inadequate and in some cases inappropriate.

The idealogy of environmental policy is one of policing conservation rather than one of enhancing material benefits. There is a virtual absence of appropriate incentives.

There is inadequate capacity in the various agencies. The specific skills needed in environmental management is lacking. This is compounded by the fact that there is an insufficient financial basis to address these issues.

Attempts to reform legislation are partial, dealing either with environment alone, tenure alone, communal areas or local government alone. There is a need to bring these processes together.

There are insufficient linkages to communities (inputs and responsibilities). Women are not well represented on decision-making bodies charged with natural resource and environmental management.

Conclusions: Integrated policy framework to promote improved land and natural resources management.

The policy framework integrates 3 perspectives that must be addressed:

Economic, Educational and Institutional

The economic framework includes state supported investments which improve opportunities to manage land sustainably. These may include investing in water development, infrastructure etc.

The educational framework involves the educational initiatives, including extension, research, capacity building, information and so forth.

The institutional framework includes enabling legislation, regulatory, administrative and legal structures

As most of the legislative and organisational apparatus pertaining to the environment has concentrated primarily on the regulatory controls, it is proposed that any new land and natural resource policy instruments would include both educational aspects and economic incentives for efficient use of resources.

Since a very large proportion of resource use and management activities require some degree of collective decision-making, the development of procedures, processes, and an entity through which these decisions are made constitutes the major challenge in the management and use of natural resources.

(careful development of first productive water points for communities offers one such entity)

Economic Incentives

Environmental economic policy incentives and disincentives are needed for productive households and community groups, for rural economic enterprises and rural services (grants, credit, tax incentives, subsidies, labour and training rebates etc). Recommended investments for economic policy incentives include:

- environmental infrastructure investment and promotion (wells, dams and conservation works, fencing and paddocking, water development and appropriate frameworks for drought relief)

- alternative technology promotion, development and diffusion

- specific incentives for woodland / tree regeneration and water management

- incentives for development institutions eg. NGO's

Educational Initiatives

- education: revision of school curricula, provision and use of educational institutions, use of NGO's to promote the environmental message

- information: diffusion of knowledge from environmental impact assessments

- extension: there has been a tendency for extension workers to perform a regulatory role. This approach should be abandoned as the appropriate role for extension is one of advice, education and persuasion. The various extension services should be coordinated and integrated into a coherent policy and gender sensitive approaches must be applied.

Institutional Development

With reference to village, ward and district level:

The various acts important in the discussion of natural resources must be streamlined together, including coordinated land use planning, management and monitoring. The new Act should provide for the devolution of responsibility and define local authority and procedures.

There should be an effort to recognise and strengthen customary laws. Laws must be explicit on who enforces, and what the community controls and administrative procedures are.

It is concluded that common property should be better organised through clear legal powers at the local level. With appropriate safeguards on common property rights, commons could provide a good institutional base for diversification in resource exploitation. Changes in tenure and the institutions of land and resource management which involve a decentralisation of administration and devolution of proprietorship and economic control will devolve benefits as well.

Local authorities have a key role in the management of land and natural resources. This must be defined and strengthened. It will involve a phased transfer whereby RDC's become responsive and accountable to local communities.

There is need to develop informed participatory planning and increase in local community involvement in natural resources management. This can be achieved by the following measures:

- promoting and developing viable local institutions and social structures

- devolving natural resources management and control to sub-district (ward) level
- promoting bottom-up land use and natural resource use planning with advisory services
- promoting and strengthening community natural resource management schemes for wetlands, irrigation, wildlife, forest resources, grazing etc.
- improving the role of communities in assessing land compensation on removals for public purposes
- promoting environmental public works programmes
- supporting local capacity building and integrated planning

Outline of Administrative Institutional Arrangements

It is recommended that a district level "land adjudication / local government entity" be established, composed of the Councillors, Chief, Agritex provincial planning officer, traditional leaders etc. Such an entity would also be advised by a new "district level land and natural resources board", with extension staff from Agritex, Forestry and Natural Resources serving in an advisory or consultative capacity. Practically speaking, the district level "land adjudication / local government entity" referred to could be an enhanced and strengthened RDC or some sub-unit.

At the Ward level an analogous "land / natural resources board" would be established, which is answerable to the WADCO.

At the Community level, the administrative institutional arrangements are designed to:

- provide a framework for the empowerment of communities in the utilisation and management of natural resources through appropriate tenure systems

- provide a framework for effective community participation in the planning, implementation, monitoring and evaluation of sustainable community environmental projects ie. bottom-up approach

- enhance a culture of accountability and self-help in natural resource utilisation and environmental management in rural communities

Recommendations on Communal Areas

CAMPFIRE is a qualified success and demonstrates probably the most important recommendation of the Commission. That is, rural communities can own and utilise resources effectively and sustainably provided there are clear benefits to the community and that the community is empowered through local level institutions. The current problems include conflict in the relevant districts between those wards receiving proceeds from the programme and those not benefitting.

(in many ways, the proposed research is to develop a CAMPFIRE equivalent for those communities and RDC's not blessed with the wildlife resource)

Investment and Productivity

The Commission recommends strongly that Government restores political priority to the development of Communal Areas through increased public sector investment into roads, water, electricity, telecommunications and social infrastructure.

The proposed administrative structure at village level also provides an easier and more secure vehicle for rural credit. For instance, the AFC's group lending scheme should in future be based on villages where each village assembly recommends and/or guarantees credit-worthy farmers. Villages may also apply for medium to long term loans to invest in village infrastructure such as boreholes and small scale irrigation. Such financing arrangements do not have to be restricted to the AFC, and should be workable for commercial banks, credit houses, wholesalers, input suppliers and other financiers.

APPENDIX 5: Instrumented catchment studies as an integral part of the national water resources management strategy

The Concept of Community-Based Catchment Management

- Policy makers and funding agencies are showing increased interest in Integrated Catchment Management (ICM) as a practical means of halting environmental degradation and promoting sustainable agricultural development in dryland areas.

- ICM programmes that are showing most potential are those that include a high level of community participation both in decision making and in the implementation of improved resource management.

- National Agriculture and Water Policy in Zimbabwe urgently calls for community empowerment for decision making and resource management.

- People will benefit most from working collectively to protect and manage their resources in a productive way.

- The Catchment is the logical physical unit at which to manage natural resources.

- Community-Based Catchment Management can provide the building blocks for Integrated Catchment Management and can help underpin development of the national Water Resources Management Strategy.

Catchment Studies

- There is presently a lack of research into hydrological processes throughout the region which is hindering the development of water resources. In particular, few studies have been undertaken to monitor small catchments.

- Whilst there are many large-guaged catchments with areas of hundreds or thousands of km^2, because of spatial variability of hydrological processes and generally limited instrumentation, it is not possible to partition different processes or quantify the impact of various and changing land use practices.

- This is especially true in dryland areas. Without data from small catchments, or without better instrumented larger catchments, reliable water resource management cannot be possible.

The Importance of Scale

- The size of small catchment studied is vital. It should be small enough to allow direct measurement of processes contributing to the water balance and to minimise

meteorological & geological variability, but large enough to reflect the discontinuous nature typical of catchments in the particular physical setting.

- In areas of crystalline basement rock (which cover about two-thirds of Zimbabwe) this scale of catchment is typically of the order 10 - 20 km2.

- It is the same scale at which groundwater points and community gardens are being established in ODA / GOZ work and at which small dams and associated community projects are being established by others eg. CARE, LWF.

- In dryland areas, good water resource management at this local scale is the key to sustainable social and agricultural development.

- In Zimbabwe, collective action at this local scale may involve a group of families, a Kraal, several Kraals, a whole community, a VIDCO, or parts of several VIDCO's.

- It matters less which type of social group. More important is that social cohesion exists, with commitment to improving well being as a group, and the group clearly recognises ownership and responsibility to manage and protect the resources.

- At a local scale, say at each productive water point implemented in NGADI, the challenge lies in overlaying the best social group with which to work with the best physical scale at which to manage the natural resources.

- At a regional scale, the challenge lies in bringing together the findings at small catchment scale in the different principle physical and social settings, and to provide sustainable development and management of water resources at the river basin scale.

- The opportunity exists to nest the required small catchment studies in different physical and social settings within a larger river basin. In this way, the small catchment studies will provide the building blocks for the required 'semi-rid' pilot catchment study and become an integral part of the national Water Resources Management Strategy.

- The attached figure illustrates how this may be possible in, for example, the Chiredzi River catchment. Studies at this scale will bring together stakeholder from Communal, Resettlement and Commercial sectors.

- In the case of the Chiredzi River, stakeholders Mkwasine Sugar Estate have expressed interest in providing some financial support if the pilot catchment study can help to analyse water resource management within their catchment.

APPENDIX 6: Potential options for research support to enhance the productivity and sustainability of rainfed and livestock farming in dryland agricultural catchment systems incorporating a reliable, productive water point

By Professor Dyno Keatinge

The creation of a very small island of irrigated agriculture through the provision of a secure water source in a much larger dryland agricultural catchment has been indicated by the CRMLS Phase 1 survey to have a substantial and immediate beneficial effect on the surrounding agricultural communities. The provision of a dependable, though small, income source from irrigated community-based vegetable gardening and associated implications for providing potential collateral for acquisition of formal loans and increased security for informal "savings clubs" has resulted in a considerable diversity in investment in new agricultural enterprises. These include initiatives involving smallstock, poultry, pigs, goats, cattle, agroforestry, fruit, vegetables and new agricultural equipment (Table 3.6). These, and other new non-agricultural household initiatives (Table 3.7) must inevitably have key implications for the productivity and sustainability of existing and potential future dryland agricultural systems practised in the associated catchment and beyond. Eighty two percent of garden member respondents indicated that they had changed their farming practices as a result of the collector well scheme and that 41% now hire labour for agricultural activities (Section 3.4.1). Three beneficial implications of these changes were:

a) that labour constraints for traditional tasks such as weeding rainfed fields were made less critical as the ability to make immediate cash payments to young (often semi-landless) males encouraged the formation of an available labour pool;

b) that a greater proportion of productive land was farmed annually than previously had been possible; and,

c) that the quality and quantity of farm extension advice had consistently improved and that a more constructive relationship had been established with local AGRITEX and associated agricultural extension professionals (Section 3.4.1).

The latter point is of key importance to the future development of these and the large number of potentially similar agricultural communities which may benefit from the forthcoming NGADI development scheme. If truly sustainable systems for agricultural and natural resource management are to be put into place in S.E. Zimbabwe as a result of development efforts, several realities will have to be faced namely:

1. Drought will be a continuing factor dominating dryland agricultural systems, the risk of crop failure and periodic large scale mortality occurring amongst ruminant populations must be ever-present design factors in the development of future "improved" farming strategies;

2. Development occurring as a result of short-term abuse of natural resources such as engendered by chronic overstocking and practices encouraging soil nutrient depletion, erosion and overuse of groundwater must be avoided;

3. Land tenure systems will need to be clarified, made more secure and explicitly recognised by the inhabitants of the communities in question and by their formal and informal administrative leaders;

4. Community development must take place from a truly informed position of the potential options available and of their possible implications into the future. To engender this enhanced local knowledge is presently one of the major tasks of supporting research and development services and to be more effective than previously they need to employ a much more participatory approach. An equitable balance in decision making must be struck between all stakeholders and concerned organisations within their appropriate geographic, environmental and political recommendation domains.

Given these provisos, the research services serving the Communal Areas are now confronted with a challenging mandate to predict a range of optional agricultural systems scenarios at a village, district and regional level arising from the provision of secure and productive water points. Initial issues that therefore would have to be considered seem to include:

i. Are waterpoints really secure given potential extraction and recharge rates? To answer this requires detailed hydrological studies in a representative set of instrumented small catchments.

ii. Given that research should be executed in a participatory mode with the farming communities and their administrative representatives formulating joint-priorities according to current theory, how should previously unconsidered and untested options such as a new crop or livestock practice be potentially assessed for introduction within this methodological context? One approach is to model various management scenarios. A second approach is to develop demonstration catchments where, through participative farmer research, different management options are scientifically assessed.

iii. Are productive water points most effectively used when associated with communal vegetable gardens or are there possibly better alternatives to be considered within the context of the greater dryland agricultural system?

iv. If water point vegetable gardens are the most productive use of available water after domestic needs have been fulfilled, how can local resources be most effectively utilised (improved vegetable agronomy) and how great is the potential future market if groundwater sources were fully exploited throughout S.E. Zimbabwe in a similar manner?

v. Even if water point vegetable gardens are the most productive use of water and land resources at a given point, would a greater diversity of enterprises within catchments or other social units based on these secure water points provide better regional economic buffering against the effects of severe drought?

vi. Given that severe herd depletion and thus lack of draught power is a consequence of chronic drought events, what options might exist in using secure water points to both

maintain a greater proportion of critical breeding animals throughout drought phases and how best to ensure their more rapid recovery to body conditions enabling draught work, reproduction and milk yields at full breed potential?

vii. What possibilities exist within current farming systems and climatic patterns to ensure that soil and water resources are maintained and enhanced through manipulation of cropping sequences and more effective use of livestock manure resources?

viii. How will the plethora of new agricultural initiatives currently stimulated by existing well schemes impact on available animal feed resources ? Are traditional authorities and land tenurial systems capable of adequately safeguarding the control and equitable use of natural resources?

ix. Are there alternative uses of productive water points that might be of substantial benefit to the local agricultural communities and to the export economy of S.E. Zimbabwe and beyond, such as high value non-traditional horticultural production (spice crops, nuts, registered seed etc.) or intensive dairy activities (with value added yoghurt, and cheese production) ?

x. What agroforestry options could be exploited throughout catchments, given the possibility with well water of raising tree nurseries and providing sufficient supplemental water to saplings after planting to ensure safe establishment?

xi. What marketing and other post-harvest initiatives will be needed at a district and regional level to ensure that improved productivity can be fully encouraged and capitalised on at a local level.

xii. What policy implications are there if infrastructural constraints such as credit availability, education, extension advice, local transport and input supply are to be in synergy with the expected developmental thrusts?

Such questions are only a sample of what needs to be considered if a pragmatically complex view of the development of farming systems in dryland agricultural catchments is to be adopted and thus if problems are to be effectively addressed in S.E. Zimbabwe. Attempting to make simple interventions without reference to the surrounding system complexity has proven in the past to be largely unsuccessful However, given the substantial existing background information provided by the findings of the Romwe Catchment Scheme, the Collector Well Programme, the forthcoming NGADI scheme and the CRMLS Phase 1 Study, provides a unique opportunity by which development within such a complex system could be better understood and thus has a good chance of success. Moreover, with ongoing research this success at a local level has a strong possibility of permitting effective scaling up to regional level. This would provide a successful example of development for potential export to the other large areas of sub-Saharan Africa with comparable granitic basement rock geology to aid fulfilment of ODA's Semi-Arid Production System goal and purposes.

APPENDIX 7: List of persons consulted during CRMLS phase I

The following individuals contributed to CRMLS Phase I and to the ideas and recommendations presented in this report. There are many others not specifically mentioned, not least, the communities who gave much of their time to the surveys. The CRMLS Phase I project represents the latest stage of a programme now nearly ten years old, and as such it represents a synthesis of the knowledge of a large and varied group of people, communities, technicians, researchers, administrators and others.

Mr P Baloyi	SAEO (Irrigation), Agritex, Chiredzi
Dr J Barrett	Systems Manager, NRSP, ODA.
Dr Charles Batchelor	Institute of Hydrology
Dr Roger Blench	Research Fellow, ODI
Mr B. Butaumocho	ADAEO, Agritex
Mr John Butterworth	Institute of Hydrology
Mr Robin Cadwallader	Senior Engineering Adviser, BDDCA
Mr Eamon Cassidy	Economic Adviser, BDDCA
Mr S Chamisa	ADA, MLGRUD, Bikita
Ms Joy Chidavaenzi	Regional Director, African Centre for Holistic Management
Mr Morris Chidavaenzi	The Blair Research Institute, Ministry of Health
Mr Fabeon Chigumira Ngwerume	Horticultural Research Centre, R&SS
Mr Pasca Chipadza	PAEO, Agritex
Mr G Chipika	ADA, MLGRUD, Chivi
Mr A Chitavati	NRB, Bikita
Mr Dale Doré	Consultant
Mr Peter Dorwood	Farming Systems Adviser, University of Reading
Mr Terence Dube	Agricultural Assistant, Lowveld Research Stations
Mr G Gumbo	CEO, Zaka RDC
Ms Amanda Hammer	Consultant
Mr John Hansell	Senior Natural Resources Adviser, BDDCA
Ms C Hodza	Forestry Commission, Masvingo
Dr David Jackson	NRI
Ms B Jiji	Agritex, Masvingo
Ms Elisabeth Jones	APO, Engineering Div., ODA
Prof. Dyno Keatinge	Agricultural Systems Adviser, University of Reading
Mr Chris Lewcock	Research Manager, SAPS (NRSP) NRI
Dr Chris Lovell	Institute of Hydrology
Mr Mil Lupankwa	Department of Geology, University of Zimbabwe
Mr Michael Machote	Planning Officer, Bikita RDC
Mr C Mago	Department of Water Development
Mr Andrew Mahlekete	AEW, Agritex, Chivi
Mr J Maluleke	AEO Projects, Chiredzi RDC
Mr J Mangenda	The Blair Research Institute, Ministry of Health
Mr G Mapeza	Agritex
Ms M Masiyandima	Dept Soil Science, University of Zimbabwe
Mr C Matereke	AEO Projects, Zaka RDC
Ms Katherine Mathers	CARE International Zimbabwe

Mr Brian Mathew	Project Support Officer, Bikita IRWSSP
Mrs Girlmerina Matiza	Economist, WRMS
Mr J Mpamhadzi	CEO, Bikita RDC
Mr Isiah Mharapara	Head, Lowveld Research Stations, R&SS
Mr Owen Mhere	Livestock Section, Matopos Research Station
Cl. M.D. Mhlanga	Councillor, Ward 23, Romwe Catchment
Prof. James Milford	Physics Dept., University of Zimbabwe
Mr B.G. Mombeshora	Head Farming Systems Research, R&SS
Mr Patrick Moriarty	Institute of Hydrology, Romwe Catchment
Mr Shelton Msika	Department of Water Development, Masvingo
Mr Godwin Mtetwa	Research Technician, Lowveld Research Stations
Mr Francis Mugabe	Research Officer, Lowveld Research Stations
Mr Phanuel Mugabe	Centre Applied Social Sciences, University of Zimbabwe
Dr Fanuel Nangati	Social Development Adviser
Mr R Nbatshani	Water Project, Zvishavane
Dr Calvin Nhira	Centre Applied Social Studies, University of Zimbabwe
Mr George Nhunhama	National Coordinator, NCU, MLGRUD
Mr Jacob Nyagweta	Physics Dept, University of Zimbabwe
Mr W Nyanhanga	Agritex
Dr Richard Owen	Geology Dept, University of Zimbabwe
Mr David Pagare	DAEO, Agritex, Bikita
Mr Simon Pazvakavambwa	Technical Coordinator, WRMS
Ms Jane Pearey	2nd Secretary Aid, British High Commission
Prof. Mandivamba Rukuni	Agricultural Research Council
Dr Jefta Sakupwanya	Management Strategist, WRMS
Mr Darlington Sarupinda	Monitoring & Evaluation Unit, Agritex
Mr John Scoggan	CARE International Zimbabwe
Mr L Shumba	DIH, MNAECC, Bikita
Mrs Annie Sithole	Romwe Catchment
Dr Paul Taylor	Director, IWSD, University of Zimbabwe
Mr G Tembo	District Administrator, Chivi
Dr Steve Twomlow	Silsoe Research Institute
Mr Willem van Harderwyk	IUCN-MRDC Chirima Project
Ms Millie Vela	ITDG, Chivi
Mr Dominic Waughray	Institute of Hydrology
Ms Sushela Zeitlin	Social Development Adviser, BDDCA