

**INTEGRATED WATERSHED MANAGEMENT FOR MINIMIZING LAND DEGRADATION AND
ENHANCING LIVELIHOODS OF RESOURCE POOR FARMERS
A CASE OF PUNGWE RIVER WATERSHED, ZIMBABWE**

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ABSTRACT

Degradation of watersheds in Pungwe has brought long term reduction of the quantity and quality of land and water resources. Changes in watershed have resulted in a range of natural and anthropogenic factors such as soil erosion, changes in the farming systems, over exploitation of water resources, overgrazing, deforestation, and pollution. The combination of environmental costs and socio-economic impacts has heightened the vulnerability of farmers in Pungwe. Without urgent investment in watershed management the costs are catastrophic. The research used both qualitative and quantitative research methodologies. The results indicated economic growth has been insufficient to offer alternative means of sustainable livelihood to the rural poor, hence farmers have relied more on the environment for the provision of firewood, fodder, food and fibre. Land use practices in the watershed have resulted in transformation of the hydrological cycle, declines in biodiversity, degradation of soil and water, and over exploitation of native species. Effort should be diverted towards protecting or conserving the hydrologic services and reducing or avoiding negative downstream or groundwater impacts. Watershed management needs to be adopted within the context of the local situation, changes in natural resources and climate. Community watershed management's success depends on local participation and collective action by stakeholders. There is need to focus on multi-stakeholder participation, linking social, technical and policy concerns in a pluralist collaborative process. Formulation of policies enabling collective action for management of resources is urgently required. The research recommends that there is need to manage natural resources on a smaller catchment scale of (650 to 4,000 hectares) by adopting a sustainable livelihood approach and espouse a holistic community watershed approach using water management as an entry point for improving livelihoods. The community should appreciate that soil conservation measures are just the beginning for watershed management and not an end, as generally adopted, and enhancement of partnerships and institutional innovations through a consortium approach should be the major impetus for harnessing the watershed's potential to reduce household poverty in the study area.

Keywords: Integrated Watershed Management, Livelihoods, Land Degradation, Sustainable Development, Zimbabwe

BACKGROUND OF THE STUDY

The integrated watershed management in Zimbabwe is a forerunner of sustainable rural development as advocated at the 1992 Rio Summit. Both approaches share a systematic view of biophysical and social interactions, a concern for the on and off site and the short- and long- term effects of change, and a fundamental belief that appropriate social management can optimize the functioning of human ecosystems. This shared paradigm suggests that it is difficult to distinguish

integrated watershed management from sustainable development. However, the approach has not brought the intended positive impacts on rural livelihood and the environment.

The disappointing results in Pungwe watershed are largely due to lack of sustainability and equity. Pungwe watershed has no strategy for maintaining assets after the support ends, and the only benefit that the farmers derive from the watershed project is short term paid work. Communities in Pungwe see few long- term benefits from the project, so have little interest in operating and maintaining project assets. Furthermore, the farming system in Pungwe watershed depends on mixed agriculture, where forests in the watershed are cleared to cultivate root crops, cereals and groundnuts, among other cash crops. The number of cattle and other ruminants overwhelm the carrying capacity of the watershed. Rain-fed farming and land management systems in Pungwe watershed are characterized by their physical isolation; lack of roads and markets hinders its economic development.

Deforestation and consequent loss of biodiversity is a serious issue which affects watershed management in the study area. Because of locally increasing population pressure, fallow periods are shortened, resulting in soil fertility loss and yield decline, which drive further degradation. The agricultural potential in Pungwe watershed is moderate. Despite the existence of large uncultivated areas, only modest yields are expected in the near future (Chifamba, 2011). The fragility of the soils and the call for rainforest protection, with its associated biodiversity and multiple environmental services, represent strong arguments against further extension of the agricultural system in the watershed.

People in the watershed have transformed the hydrologic cycle to provide fresh water for irrigation and domestic consumption. Furthermore, the anthropogenic nutrient inputs to the biosphere from fertilizers now exceed natural sources and have widespread effects on water quality and fresh water ecosystems in the watershed. Mismanagement of land has also caused declines in biodiversity through the loss, modification, and fragmentation of habitats; degradation of the soil and water; and over-exploitation of native species. Land use change in the watershed has profoundly altered ecosystems as vegetation is cleared and biomass diverted for human consumption. Unintended environmental consequences potentially undermine future land-use options in the Pungwe watershed. Forms of land use in the watershed are degrading the ecosystems and services on which people depend (Wani and others, 2005).

Poverty, agriculture and land use in Pungwe watershed make a complex and challenging system with many flaws and interacting elements. Poor farmers in Pungwe do not want to be poor, and a few choose to actively damage their environment in the watershed. The reason so many farmers in the watershed are living on the edge of survival is that too many of their traditional approaches to agricultural production are breaking down. Economic growth in the watershed has been insufficient to offer alternative means of employment for the poor. Profits from farming at low levels of productivity in Pungwe watershed have been too small to allow farmers to reinvest in their farms and maintain productivity at acceptable levels. Meanwhile, continual increases in population have depleted both available resource base and social entitlements that hitherto provided a state of equilibrium in Pungwe watershed.

Current trends in land use in the study area allow farmers to appropriate an ever- larger fraction of the watershed's goods and services while simultaneously diminishing its ecosystem capacity to sustain food production, maintain fresh water and forest resources, regulate climate and air and mediate infectious diseases. Nevertheless, the conclusion is clear: land use practices in the watershed, while increasing short term supplies of material goods; this will undermine ecosystem services in the long run. (Wani and others, 2002; Chifamba, 2011)

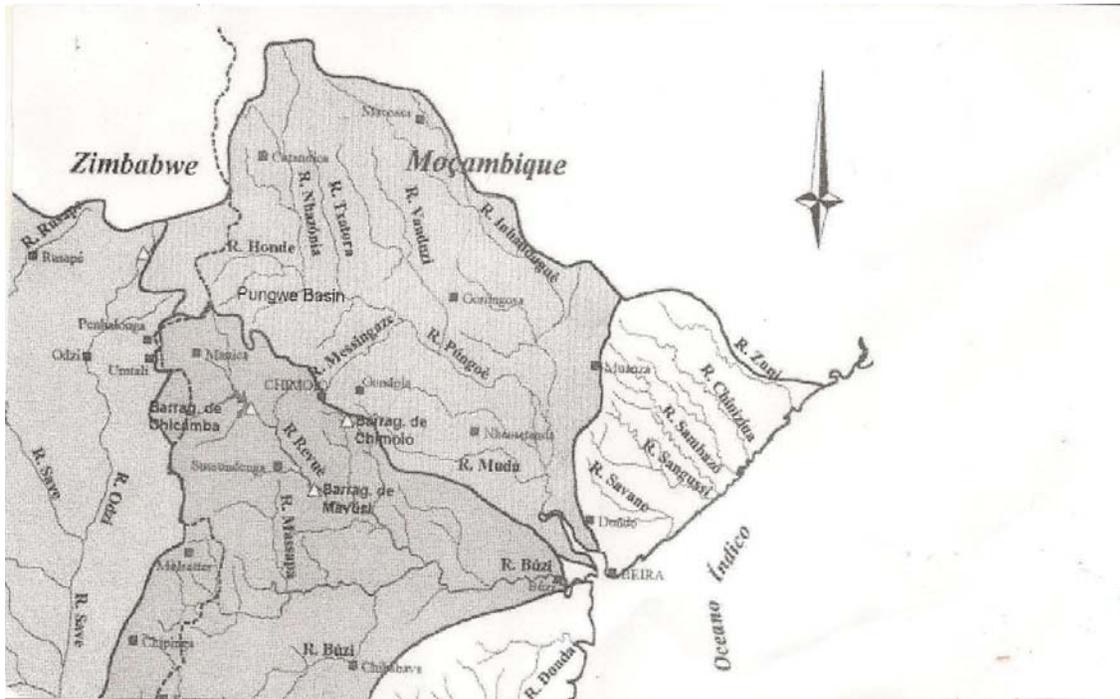
Land use practices are changing watershed landscape patterns, ecosystem function and climatic dynamics, biodiversity and soil nutrients. Although local change is largely driven by nature, humans in Pungwe have become a significant environmental force with vast implications for watershed systems. Unfavourable population growth and subsequent increases in land fragmentation have caused continuous decline in households' natural, physical and financial assets over the last decade. Shrinking land areas have led to over-exploitation of soil and progressively decreasing of yields. Lack of cash, labour (due to outward migration) and expertise prevent farmers in Pungwe from investing in soil conservation and water harvesting. In the meantime surviving patches of forests on the top of adjacent mountains are being degraded by farmers who collect firewood. Unless environmental degradation in the watershed is reversed, the future viability of food system in the study area will be imperilled.

STUDY AREA

The Pungwe River rises from the foothills of Mount Inyangeni in the eastern Zimbabwe, flows into the Honde valley where it crosses into Mozambique. This part is considered the middle Pungwe, up to the point at Bue'Maria where it reaches the plains, considered the lower part of the basin. The research was conducted on the eastern Zimbabwean areas, which constitute part of the basin. The greater part of the basin is in region 4 which receives 250-350 millimetres of yearly rainfall (Chifamba, 2011). Pungwe basin's main habitats are agricultural lands and range lands and the farming systems are dry-land; rain-fed and mixed crop livestock. Households in the study area rely on both off and on farm income and over the past years coping strategies have included diversifying livelihood strategies, intensifying agriculture, and exiting agriculture.

Watershed degradation in Pungwe has emerged as one of the most serious natural resources degradation, with negative environmental and socio-economic ramifications. Changes in farming systems in the watershed are a very significant contributor to watershed degradation. High population growth and poor economic opportunities in the study area have led to widespread cultivation on steep and highly erosion-prone slopes. Pressure on uplands arises from inequitable land distribution and the resultant overloading of carrying capacity. Figure 1 shows Pungwe basin and other adjacent basins.

Figure 1: The Pungwe basin with neighbouring basins (Revue, Buzi and Save)



Source: Ministry of Lands and Agriculture Manual, 2001

STATEMENT OF THE PROBLEM

Natural resources in Pungwe watershed are severely degraded because of soil erosion, nutrient mining, depleted ground water levels, water logging and removal of vegetation cover. Land use activities in the watershed have degraded the environment in ways that ultimately undermine ecosystem services, human welfare and long term sustainability of human societies within the watershed. The unprecedented increase of population further makes the study area a hotspot of poverty, reduced life expectancy and malnutrition. Without adopting proper watershed management to address issues of community participation, equity, sustainability and technical support the result is further environmental degradation and subsequent food shortages.

JUSTIFICATION

The research gathered information on the state of watershed, option available for scaling up watershed management and improving farmers' livelihood in Pungwe Basin. The research further proposed recommendation to stakeholders in watershed management and restoration. The information gathered is important to stakeholders in watershed management. These stakeholders include the government, quasi-government institutions such as district councils and Non-Governmental Organizations (NGOs). The research will assist institutions to see the impact of unsustainable land-use on watershed ecosystems and food security. As a result, recommendations for improving watershed management would be easily comprehended and adopted by stakeholders in the study area. These institutions will find the information important since it will give option available for sustainable management of watershed resources.

AIM AND OBJECTIVES

Aim

The major aim of the study is to assess the state of watershed in Pungwe and document options available for scaling up watershed management to enhance livelihoods of resource poor farmers.

Specific Objectives

The following objectives guide discussion in this study: assessing the state of watershed in order to enhance the livelihoods of resource poor farmers in the study area; evaluating the factors affecting sustainable watershed management to reduce and reverse the rate of degradation of the natural resources base important in maintaining efficient productive systems, and generating recommendations for stakeholders in watershed management which will assist in devising sustainable watershed conservation approaches.

RESEACH METHODOLOGIES

The study used both qualitative and quantitative research methodologies. The questionnaire was the only quantitative data collection tool used to obtain participants' background information such as age, gender, educational level and marital status. In the qualitative methodologies a number of methods were used, which included focus group discussions and semi-structured interviews with key stakeholders such as chiefs, kraal heads, farmers and communal farmers' unions and local community members. Semi-structured interviews assisted the researcher to get additional information on the causes of watershed degradation, by asking follow up questions, especially where responses were ambiguous. Rapid Rural Appraisal (PRA) was also used to assess the general environmental conditions in the watershed. Participants were selected on the basis of their community responsibilities, vulnerability due to watershed degradation and livelihoods. The research collected information from 100 participants who were drawn from different socio-economic backgrounds. Informants were selected on a random sampling basis, and wherever required, purposive sampling was carried out. The data was analyzed using Statistical Package for Social Sciences (SPSS) and presented in graphs.

RESEACH FINDINGS

Age-Sex

The research utilized respondents from both sexes, but females constituted the majority compared to their male counterparts (63% as compared to 57%). Most able - bodied men are leaving the study area because the ecosystem is becoming more fragile due to climate change and over-population. The ages of respondents ranged from slightly below 20 years to 65 years. All the respondents were economically active and no participant was in the retirement age or a minor. Participants were selected on the basis of their experiences and knowledge, which they possess and pass over to other generations over a specified period of time. Table one show the age-sex profile of respondents

Table 1: Age-Sex Profile of Respondents

| Age group | Females | Males |
|----------------|---------|-------|
| Below 20 years | 6 | 4 |
| 21-30 | 12 | 10 |
| 31-40 | 7 | 11 |
| 41-50 | 24 | 15 |
| 51-65 | 14 | 16 |
| total | 63 | 57 |

Source: Survey, 2011

Academic Qualification of Respondents

Participants were drawn from different educational backgrounds. The sample included participants with formal education, elementary and those with tertiary education. Quite a number of respondents had acquired tertiary education, as 73% of them had at least Zimbabwe junior certificate level of education. Of the above mentioned group, 24% had at least attained an ordinary level and 17% of participants are degree holders. Only a few had no formal education (7%). This shows that the majority of participants were literate. These people can be trained to lead teams which should be formed to spearhead sustainable watershed management programmes. With proper organization and efficient institutions, the local communities can be trained and capacitated to manage their watershed in order to improve their livelihoods and guarantee household food security.

Marital Status of Respondents

The respondents were drawn from different marital statuses, which ranged from married, widowed, divorced and single. Marital status of respondents was crucial because it determines the rate at which a household rely on the local environment. The study noted that most female headed households are poor and poverty cause households to rely more on the extraction of natural resources from the watershed. The majority of respondents were married 54% and 21% of them were single, of which males were the majority. The widowed and the divorced constituted a combined 25% (15% and 10% respectively).

AN OVERVIEW OF THE STATE OF PUNGWE WATERSHED

The Pungwe River is shared by two countries namely Zimbabwe and Mozambique. The governments of Zimbabwe and Mozambique have recognized the importance of sustainable watershed management of the rivers and have therefore, jointly emerged on the project named Pungwe River Basin Joint Integrated Water Resources Management Strategy or simply Pungwe Project. The Pungwe project is a cross-sectional process which involves a number of stakeholders in the management of watershed resources. The Pungwe Project is financed by the Swedish International Development Cooperation Agency (SIDA), through a memorandum of understanding with Zimbabwe and Mozambique. However, despite the involvement of two governments, local communities and non- governmental organizations, Pungwe watershed has remained degraded.

Since 1995, the Zimbabwe government in partnership with SIDA have implemented an integrated watershed management strategy in the Pungwe catchment aimed at improving the conservation and management of watershed natural resources to enhance their use in sustainable economic production, and alleviating poverty and improving sustainable livelihood opportunities, since local needs are met by watershed natural resources exploitation (Burn and Kenneth, 2000). Meeting these objectives simultaneously has become a major challenge due to the degraded state of the watershed.

Pungwe watershed is characterized by a decrease in the amount of stream discharge due to reduced rainfall, deforestation and land degradation. Some feeder streams in the watershed have completely dried up. Flows in the upper Pungwe watershed have decreased from 6,7m³ to 2,4m³ per second, a 64 percent reduction (Chifamba, 2011). During the dry season the flow in the watershed usually become low and most river beds become exposed. During prolonged rainfall shortages, water sources in the watershed become scarce, stagnant and contaminated raising incidence of water borne diseases. Changes in the amount of rainfall patterns have reduced the total amount of land available for agriculture.

Vegetation in the study area is now inadequate to retain rainfall, humidity and soil. The rainy season often starts in December, already two months late, and has longer and more frequent interruptions. Rainfall washes away huge amounts of fertile sediment and further exposes farmers in the watershed to increasing risk. The research further noted that population increases and subsequent increases in land fragmentation have caused continuous decline in households' natural, physical and financial assets over the last two decades.

The research revealed that storage function of the watershed is highly vulnerable because of the steep slopes in the upper watershed and the absence of trees has further exposed the top soil to agents of soil erosion. Agricultural soils in the watershed are exposed to erosion because low organic matter levels and weak geological structures reduce their resilience to erosive forces. In the middle part of the watershed plant invasion is destroying the structure of residue forests. The research noted that the weedy Vine Banana Poka (*Passiflora Mollissima*) have climbed over tree crowns occluding sunlight and reducing growth, and reproduction of the host trees. This has resulted in the collapse of vegetation and increase in land degradation.

The water quality in the Pungwe basin is affected by human settlements, geology, and vegetation. Human settlement in the watershed invariably alters the natural state of the quality of both surface and ground water through the different land uses. The research noted that excavations for gold panning loosen the soil, leading to increased soil erosion during the rainy season. The operation also strips the protective vegetation cover, thereby creating conditions for further erosion and degradation of the watershed.

The poor state of the watershed, farmers' reliance on agriculture, poverty and hunger means that sustainable watershed management should be a government priority. Measures need to be taken to make distribution of watershed resources more equitable, land more productive and counteract watershed degradation.

FACTORS AFFECTING SUSTAINABLE WATERSHED MANAGEMENT IN PUNGWE

Land degradation in Pungwe is perhaps the most widespread example of an environmental issue having a direct impact on human populations living in the watershed. Farmers in the study area have continued to use traditional agricultural practices on a fragile environment and this has exacerbated soil erosion, disruption of hydrological cycle and decline in productivity, thereby undermining food security. The increase in poverty has caused farmers to rely more on the extraction of resources from the environment (Mitchell, 1997). The study revealed that as land degradation becomes

more severe, farmers in the study area are left with few options, other than to seek another piece of land on which to earn a livelihood. The migration of farmers from the upper watershed to lower watershed indicate that when marginal land is no longer available, farmers tend to move to clear forests and to other already overburdened areas (Pretty and Shah, 1997).

The most common example of unsustainable agriculture in the study area is the traditional open furrow agriculture and overgrazing on sloping lands, which leads to soil erosion and uncontrolled rainfall run-off. The consequences are leading to far reaching environmental impacts such as gully formation, siltation and sedimentation of water courses (Kerr, 2002). Furthermore, the predominant land use mosaic of small farms practicing unsustainable agriculture, where erosion and run-off are common heightens the vulnerability of the watershed to severe weather conditions. The undeniable link between poverty, hunger and environmental degradation create the most compelling reason why environmental monitoring should continue to be an important part of an approach to rural development in Pungwe (Shrubsole and Mitchell, 1997).

Expanding human requirements and economic activities in the study area have placed ever increasing pressures on land resources, creating competition and conflicts and resulting in overexploitation of both land and land resources within the watershed. If human requirements are to be met in a sustainable manner, it is now essential to resolve these conflicts and move towards more effective and efficient use of land and its natural resources (Grand River Conservation Authority, 1998). Integrated physical and land use planning and management are eminently practical ways to achieve this objective. Land resources in the study area are used for a variety of purposes which interact and compete with one another; therefore, it is desirable to plan and manage all uses in an integrated manner.

The population in the study area has grown beyond the carrying capacity of the local environment and their resources. Although local communities have decided to address this situation through migration, pressure on the environment has continued to increase. The study noted that many upland people, especially the youth and young families, have migrated to find better opportunities in lowlands and adjacent urban areas such as Mutare and Vumba. Population pressure on downstream ecosystems and the demand for upstream ecosystem resources and services, such as fish, water and firewood have increased, resulting in unsustainable exploitation of resources.

The study further revealed that there is overwhelming evidence in Pungwe that climate is a major issue affecting watershed management. Changes in the hydrological cycle have been detected, particularly in the upper course of the watershed, where rainfall has decreased and become more erratic. As most of the fresh water used by humans originates from precipitation in the upper watershed, the impact of climate change has become a major issue. Hostile climatic conditions have been compounded by changes in land use which have reshaped watershed landscape patterns and ecosystem function (Kerr and Chung, 2001). Although local climatic change is largely driven by nature, humans have become a significant environmental force with vast implications for watershed systems. Humans are not only subject to environmental change, but also constitute one of the main driving forces behind that change (Hart and others, 2002).

Second generation forests in Pungwe Watershed are being threatened by degradation and conversion to other types of land uses, influenced by human needs, agricultural expansion, and environmentally harmful mismanagement. The impacts of the loss and degradation of forests are in the form of soil erosion, loss of biological diversity within the watersheds, damage to wildlife habitats and degradation of watershed areas, deterioration of the quality of life and reduction of the options for development. The present situation calls for the urgent and consistent action for conserving and sustaining forests resources in the watershed.

The study further noted that different types of land tenure exist side by side in the watershed. Private, state and common property regimes were found to be common in the study area. Environmental Management Statutory Instruments prevent local communities and Non- Governmental Organizations from implementing conservation work in government owned forests in the upper part of the catchment, even though these must be treated first if conservation work is to be successful. The study also noted that there is institutional rigidity. Many official conservation programmes in the area are standardized and rigid. This situation offers very little space for innovation and flexibility, though precisely these are needed if watershed approaches are to cater for the needs of the local people (Grand River Conservation Authority, 1996).

RECOMMEDATION FOR SCALING UP WATERSHED MANAGEMENT

The study indicated that watershed management approach can under the right circumstances achieve both sustainable soil and water conservation and the intensification of natural resource use needed to improve stakeholders' livelihoods. With the assistance of government and Non-Governmental Organizations, the communities in Pungwe should be capacitated to identify indigenous conservation techniques that are profitable for farmers and also offering options of interventions, combining income and conservation objectives.

Incentives for sustainable watershed management need to compensate for lost income streams (Arnstein, 1969). When forest or rangeland closures apply, or when land previously used for grazing or cultivation is selected for re-vegetation, commitment of communities to conservation need to be assured through options of income generating activities or other economic incentives. Equity issues need to be considered in targeting beneficiaries of alternative income generating activities, since the landless are generally those who are most damaged by restrictions on the use of common land (Born and Kenneth, 2000). Conservation programmes in the study area need to have clarity on how the use of subsidies to improve incentives will create sustainable watershed management, and also how benefits will be provided equitably to compensate losers, particularly the poorest. Local research and development can also help to construct least-cost and maximum-benefit technical packages. Furthermore, watershed management programmes should not only focus on on-site benefits, but also on the impact of conservation programmes on the environment (World Commission on Dams, 2001).

The most successful watershed conservation programmes to date have been those where stakeholders were partners in the research process at all stages of identification, design, implementation, and evaluation, and technologies were offered as a range of choices to be adopted rather than as prescription (Nakayama and others, 2000; Swallow and others, 2001). Potential technological strategies should be tested through on-farm research where stakeholders are supported to adapt the technologies to the site-specific conditions. This step by step process of watershed technology development allows labour and input costs to be spread out over time, reducing the risk for stakeholders. Watershed management technology should be offered as principles, methods, components, and as a basket of choices to be adopted, rather than as prescriptions (Cameron, 1997). Stakeholders should be given training and support in innovating, in evaluating results and in disseminating information. In general watershed restoration programmes should work closely with stakeholders on the lookout for indigenous innovations and be ready to build on stakeholder's ideas and practices.

It is fundamental to appreciate that participation is not a straightforward concept. A number of conditions are necessary for people in the study area to actually participate in watershed management programmes. Watershed management programmes in Pungwe must include demand-driven activities. Stakeholders must be aware of the advantages of collective action in conserving and managing watershed resources, and must be empowered to plan, implement and

manage conservation programmes. Stakeholders should also expect private economic benefits. Furthermore, sustainability of watershed management programmes requires building on existing social structure and organizations (Swallow and others, 2001). Finally, key requirements for success of participatory watershed management are careful sequencing, inclusion of all stakeholders in the process, political commitment, public agencies that understand the rational and process of participation, and sustained capacity building at all levels for both stakeholders and public agencies. Inclusion of all stakeholders in the participatory process will be important for ensuring equity and sustainability, and mechanisms may be needed to ensure the inclusion of women and marginal groups (Chifamba and Mashavira, 2001).

The planning process in watershed management should allow both community interest at the micro-level and the larger resource conservation objectives to be achieved. Any participatory planning in watershed management requires project planners to surrender the ultimate determination of the micro-watershed plan to the local community (Chifamba and Mashavira, 2011). This process needs to be organized within clear parameters, since subsidy is involved and watershed conservation project has larger objectives beyond the macro-watershed scale. The planning process has to be designed so that the interests of both the programme and the community are clear. Then, when the process of participatory planning with stakeholders at the micro-watershed level begins, this should include an examination of the impact of local land and water management on the downstream objective. Basic to this process are effective communication techniques that can, for example, present complex higher-level watershed data in a way that is intelligible and accessible to local communities (Johnson and others, 2001).

The integrated and participatory watershed management approach adopted in recent years has driven new institutional arrangements among public agencies and with local communities (Grand River Authority, Credit Valley Conservation, 2000). Successful operations should create a decentralized delivery structure that can effectively partner local communities in Pungwe. The institutional framework needs to be focused on the local level, with clear arrangements for integration within permanent agencies and for inter-agency collaboration. Government commitment to watershed management programmes in the study area is a key factor in success. The interface between local government, technical agencies, and community organizations needs to be carefully defined and managed, and capacity building at all levels is essential. Local level participatory approaches require decentralization of technical functions, and thought needs to be given to how this can reinforce (rather than conflict with) broader process to decentralize responsibilities for local development.

Watershed management in Pungwe should have a clear understanding of land and water rights and common pool resources issues and how they will work within them. Watershed management in the study area should include the land tenure and common pool resource question in the initial diagnostic and problem analysis. Furthermore, watershed management interventions have poverty reduction as an objective. However, watershed management intervention can create benefits and costs that are unevenly distributed among stakeholders (Mitchell, 1997). It is likely that improving productivity of assets and natural resources may benefit different segments of the population unequally, unless institutional mechanisms are developed to ensure that all parties benefit. Several reviews on the performance of watershed management programmes in India indicated that the landless and marginal farmers often benefit little or not at all from watershed projects (Hutchings, 1999). Thus, watershed management programmes in the study area should ensure that benefits are shared proportionally between the wealthiest and poorest farmers.

Watershed management programmes in the study area should also ensure that upstream communities (and the poor within them) do not bear the cost of providing environmental services to downstream. Watershed management agencies such as Environmental Management Agency (EMA) should assist disadvantaged communities to negotiate their claims, and should ensure that the voice of the poorer segments (especially the landless, marginal farmers, and women headed households) within the upstream communities is heard and that their interests are protected. Basin communities that empower stakeholders through participatory processes are one possible approach.

Financial and economic analysis is an important tool for designing watershed management programmes in Pungwe. Financial and economic analysis in watershed management programmes can make vital contribution to project design and implementation, and to subsequent sustainability. The question 'who pays and who benefits from improved watershed management' is crucial to the design of financial arrangement in watershed management projects and to the sustainability of watershed management programmes. It is vital to note that a number of watershed management programmes face problems in establishing incentives for sustainable soil and water conservation and pasture improvements because stakeholders perceive that they are being asked to create positive externalities for downstream users (or to reduce negative ones) without being compensated. There is need to create certain approaches to ' internalizing externalities' -that is , to compensate those who generate positive externalities and charging those who create negative ones. These approaches may include tying the adoption of conservation practices to other benefits, such as access to credit (Wani and others, 2005), full subsidy to the cost of adoption, or partial subsidy, that is, cost sharing. In addition there are innovative approaches such as Payment for Environmental Services (PESs).

Increasing positive returns for farmers while maintaining the fertility and stability of the watershed ecosystem are the best safeguard against soil degradation and related environmental impacts. The study revealed that soil and water rehabilitation and restoration programmes can be lengthy, costly, difficult process often beyond the capacity of smallholder farmers. However, practical realities, about how these programmes are designed and implemented can have a marked influence on their success, improving the sustainability of farming systems and ensuring returns to farmers.

Stakeholders should acknowledge that an effective watershed management programme requires a broad and effective monitoring and evaluation system. Effective monitoring and evaluation should provide support to day-to-day management, which is important in the multi-level matrix management structure that characterizes watershed management projects (Arnstein, 1969). Watershed monitoring and evaluating systems should be set up using low-cost, easy to use, and effective techniques.

Effective decision- making within the framework of watershed management requires a comprehensive understanding of the current state of natural resources within the watershed, its historical characteristics, societal values, livelihoods and economic influence. The revitalization of watershed planning project in the study area should begin with a background review and assessment of available information in order to identify and initiate efforts to fill information gaps. The completed information allows the participating watershed partners to have a common understanding of physical features, processes, and community issues that presently exist and once existed in the watershed. This information will provide the building blocks with which to create predictive models of the system to evaluate the impact of any proposed management options.

Managing land- use, particularly in smallholder areas where population pressure is high and degradation is accelerating, can be a zero sum situation. Watershed conservation and reforestation practices must be viewed against the backdrop of

other land use they displace or production trade-off they require (Cameron, 1997). Under circumstances in the study area, the benefits to society of improving environmental stability is justification for soil and water incentive programmes

Since the watershed span political boundaries, it should be seen as an integrative approach that has value in understanding and resolving conflicts between upstream and downstream communities. Furthermore, considering that the management of land and water resources in the study area is highly fragmented at the local level, it is recommended that consideration be given to establishing a local forum that focuses on integrated watershed management, including land use and human activities that have an impact on water and other natural resources in the watershed.

The study also revealed that land and water governance institutions and policies in the watershed are inadequate to support the integrative approach needed to implement effective watershed management. It is therefore recommended that institutions for integrated basin management be established and strengthened with appropriate resources and financing; there should be more effective and equitable communication among local communities, Agricultural Extension Officers (AEOs) and policy makers and policies which governs natural resources in the watershed should be based on clear evidence and tested principles.

CONCLUSION

Since rural poverty in Pungwe is a significant contributing factor to watershed degradation, it is recommended that the multiple linkages between poverty and watershed management be better understood and considered in the planning of both watershed management and poverty alleviation programmes. There is an urgent need to build capacity of all stakeholders (including watershed inhabitants and professionals at the local and national levels) to understand and manage the multi-sectoral processes and approaches necessary for effective watershed management. Stakeholders in watershed management in the study area should consider the adoption of multi-sectoral approach and bottom-up and top-down planning; effective monitoring and evaluation process; follow clear procedures for environmental impact assessment interventions; embrace new approaches for sharing knowledge and learning; gender balance in decision-making and devise effective coping strategies to mitigate extreme hydrological event and natural hazards in the watershed.

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