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Overcoming limited information through participatory watershed management: Case study in Amhara, Ethiopia

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Abstract

This study highlights two highly degraded watersheds in the semi-arid Amhara region of Ethiopia where integrated water resource management activities were carried out to decrease dependence on food aid through improved management of 'green' water. While top-down approaches require precise and centrally available knowledge to deal with the uncertainty in engineering design of watershed management projects, bottom-up approaches can succeed without such information by making extensive use of stakeholder knowledge. This approach works best in conjunction with the development of leadership confidence within local communities. These communities typically face a number of problems, most notably poverty, that prevent them from fully investing in the protection of their natural resources, so an integrated management system is needed to suitably address the interrelated problems.

Many different implementing agencies were brought together in the two study watersheds to address water scarcity, crop production, and soil erosion, but the cornerstone was enabling local potential through the creation and strengthening of community watershed management organizations. Leadership training and the reinforcement of stakeholder feedback as a fundamental activity led to increased ownership and willingness to take on new responsibilities. A series of small short term successes ranging from micro-enterprise cooperatives to gully rehabilitation have resulted in the pilot communities becoming confident of their own capabilities and proud to share their successes and knowledge with other communities struggling with natural resource degradation.

Keywords: Integrated community watershed management; Food aid; Ethiopia; Water scarcity; Erosion

1. Introduction

Ethiopia's population grows by 2 million per year. In a country dependent on subsistence farming, this increasing pressure has resulted in average land holdings falling from 0.5 ha/person in 1960 to 0.11 ha/person in 1999 (Special Report: FAO/WFP Crop and Food Supply Assessment Mission to Ethiopia, 2006). The Ethiopian government has officially recognized that 5–6 million of its people have lost the capacity to procure enough food to meet annual needs under normal conditions, with another 10 million susceptible to any shock, so projects that protect and improve the natural resource base are necessary for long-term survival. Since both arable land and surface water sources are severely limited, improving the soil's capacity to store rainwater was investigated. Over 90% of Ethiopia's food production comes from rain-fed agriculture so improvements in the management of this 'green' water have enormous significance.

Ongoing land degradation in Ethiopia requires urgent action at different levels of society (Nyssen et al., 2004).

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Nyssen et al. (2004) indicated that the stagnation of agricultural technology and lack of agricultural intensification in the Ethiopian highlands is the origin of present land and resource degradation. This degradation in turn becomes the underlying root of poverty. Thus, the challenge of breaking the poverty-environment trap and initiating sustainable intensification requires policy incentives and technologies that confer short-term benefits to the poor while conserving the resource base. Only by improving the natural resource base can one increase food production and lessen the need for external food supplies (Shiferaw and Holden, 1998). Therefore, to explore sustainable methods towards increased food production and its connected economic development, the goal of this study was to revitalize watersheds by keeping more rainwater ('green' water) on the land and increasing fertility. This revitalization is multidimensional and complex, requiring interdisciplinary effort to carefully design development activities. Since 'green' water development encompasses so many different activities at various scales, with each location having unique needs, an integrated approach is especially appropriate.

1.1. Integrated watershed approaches

One integrated approach for watershed management is through the use of computer models – various attempts have been made in Ethiopia to apply such methods. The Agricultural Non-Point Source Model (AGNPS) was tested on the highlands Augucho catchment by Haregeweyn and Yohannes (2003) but could not reproduce runoff patterns. The Precipitation-Runoff Modeling System (PRMS) was similarly tested by Legesse et al. (2003) for South Central Ethiopia, and needed extensive calibration to predict the monthly runoff. Ayenew and Gebreegziabher (2006) fitted a spreadsheet type water balance to predict water levels in Lake Awassa of the Rift Valley, but found that the model did not perform well in more recent years, possibly due to changing land use and neotectonism. Finally, Hengsdijk et al. (2005) applied a suite of crop growth, nutrient balance, and water erosion models to conclude that common conservation practices such as bunds, crop mulching, and reforestation may actually result in lower overall crop productivity in the highlands of northern Ethiopia.

In response to Hengsdijk's conclusions, Nyssen et al. (2006) compared Hengsdijk's predictions with field observations from the same region and found that the models over predicted crop yields while under predicting soil losses. Although such models can be applied for policy analysis, they typically need extensive calibration and cannot simulate the intricacies that farmers have to deal with on a day by day basis (Nyssen et al., 2006). When datasets are incomplete or of poor quality, other integrated approaches will likely be more effective management tools.

The modeling techniques described above were typically developed for conditions in the United States or Europe where availability of datasets for both input and calibration was not a great limitation. In contrast, the required datasets in developing countries are often available only at very limited locations, and data collection standards can be inconsistent. Integrated water management approaches that either require less information or make use of indigenous knowledge within the watershed are therefore needed. One such approach is the Smallholder System Innovations (SSI) programme in Tanzania and South Africa, which concentrates on ways to increase food production, improve rural livelihoods, and safeguard critical ecological functions through participatory development and interdisciplinary research (Rockstrom et al., 2004). Similarly, using the joint Vertisols project in Ethiopia as a case study, Jabbar et al. (2001) described the need to transition away from the traditional single discipline manner of research if complex interrelationships between environment and human are to be addressed.

Another reality of development work in Ethiopia is a dependency on food aid. It has become a contentious issue for many developing countries, with some officials even advocating the cessation of foreign aid. After more than 25 years of Food for Work programs, productivity of major crops (barley and wheat) remained stagnant, and local livelihoods in Ethiopia were not improved (Herweg, 1993; Shiferaw and Holden, 1998; Tekle, 1999). Conservation practices proposed under the Food for Work program were not seen by households as valuable means towards increasing food production. Farmers took part in the Food for Work programs because either they needed the grain or were forced to participate (Tekle, 1999). Tekle further showed in a study of South Wollo, Ethiopia that the main problem with Food for Work programs was the lack of attention given to attitudes of local people towards conservation programs and what their priorities were. In most programs local people were not consulted at all, making it impossible for these communities to accept any kind of responsibility. Public opposition to projects most often arises from either a lack of accurate knowledge or inadequate involvement in the decision-making process (Planning and Decision Making, 1999), so the obvious solution is to have farmers become involved in both the information gathering and decision processes. Therefore, our integrated watershed management approach was to give local farming communities control of both the planning and distribution of Food for Work aid, thus meeting short-term food needs while sustainably improving the resource base.

1.2. Pilot watersheds

With this in mind, two pilot watersheds from food insecure areas of the Amhara region, Yeku and Lenche Dima, were selected in conjunction with the Amhara Micro-enterprise development, Agricultural Research, Extension, and Watershed Management Project (AMAREW) to test integrated watershed management techniques in Ethiopia. Locations of these sites are shown in Fig. 1. Both watersheds are almost entirely comprised of subsistence farming. Rain-fed crops, mostly cereals, are cultivated in the flatter