



Cooperative watershed management in Haiti common property and collective action

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An empirical analysis of factors underlying successful collective action in watershed management in Haiti.

[Degraded uplands in Haiti](#)

The debate over common property among development professionals is becoming increasingly active. A growing number of researchers and practitioners question the application of the "tragedy of the commons" paradigm to resource overuse, yet a broader and more elaborate theory of common property is only now emerging. The systematic empirical examination of the factors underlying successful collective action is relatively recent (e.g. Wade, 1988; Tang, 1992). This article undertakes such an examination with regard to watershed management in Haiti.

[Watershed management in Haiti](#)

Haiti is one of the poorest countries in the Western Hemisphere and one of the most environmentally degraded. Large-scale, human-caused deforestation and soil erosion began in the colonial period when forests were cleared for coffee and sugarcane production, and they have continued to the present day with the replacement of these perennial and semi-perennial crops with annuals such as maize and beans. In response, since 1826 the government has legislated more than 100 laws and policies aimed at protecting natural forests and soils. These laws have imposed taxes, prohibitions and penalties but have not, provided incentives or conditions for appropriate land-use decisions; consequently, degradation has been little affected.

With the failure of policy instruments, since the early 1950s the Government of Haiti and aid agencies have devoted re sources and attention to the implementation of reforestation, soil conservation and watershed management projects. Such efforts have predominantly utilized

an approach characterized by large-scale treatments of contiguous land and ravines and the provision of incentives (either monetary or in kind) to stimulate peasant participation (Lilin and Koohafkan, 1987). The vast majority have also produced disappointing results (USAID, 1990; BREDA, 1988; Murray, 1979).

Degraded uplands in Haiti

In the early 1980s there began to emerge a new approach to watershed management which focused on increasing the productivity of agricultural parcels. This "agricultural parcel" approach (largely developed through an FAO-assisted project - see Box, p. 52) was based on experience that:

- farmer remuneration was not necessary for technique adoption and sometimes even acted against technique maintenance and diffusion;
- a number of low-input, indigenous erosion control techniques and agroforestry practices existed which could be improved on; and
- peasants had a natural incentive to conserve soil in order to increase agricultural production (Technical Secretariat for Watershed Management, 1990).

This approach has proved more successful. Numerous farmers have voluntarily adopted and maintained soil conservation measures in diverse areas of Haiti. The approach takes a farming rather than an engineering perspective of soil erosion and views watersheds primarily as a set of agricultural parcels within a physically defined space rather than as one contiguous physical unit. However, implementation of this approach does not resolve problems of erosion on extremely steep slopes, on ravines that demarcate or cross private property boundaries or occur between two private boundaries or on public domain lands.

Thus, a demand has emerged for development approaches that build on the success of the agricultural parcel approach, yet explicitly target transboundary erosion. This involves finding an appropriate combination of *private* incentives respecting individual parcels, and *public* incentives for transboundary problems. In Haiti, where parcels are small and erosivity high, such an approach also needs to address the linkages between individual land uses - how upstream land use affects downstream productivity and how both upstream and downstream landholders are better off if erosion is reduced. Such an approach must also promote a combination of landholder land-use agreements and independent landholder action as well as collective agreements and collective action to reduce transboundary soil losses. Both require landholder cooperation and, thus, new programme strategies and policy approaches to encourage that cooperation.

These problems of cooperation and questions as to the appropriate role of projects in encouraging cooperation revolve around a central issue: under what conditions is voluntary collective action best fomented and maintained in watershed management? For the Haitian farmer, this involves an individual choice: whether to participate in a voluntary watershed management scheme (cooperate) or not to participate (defect). However, the sum of these individual choices has collective consequences: insufficient participation leads to inadequate watershed management and hence environmental degradation of an agricultural parcel, while sufficient participation yields joint benefits in the form of reduced erosion and increased productivity of the individual shares. There is therefore an individual and collective component to the problem, making it a question of providing a "public good", where the public good is an ecologically healthy and productive watershed.

In sum, it is apparent that the achievement of watershed management requires the maintenance of cooperative institutions, but the current understanding of such institutions and

how they might be identified, evolve or be promoted, is limited. In order to develop improved theories concerning the emergence of cooperative institutions for watershed management, a number of basic questions need to be answered: What are the economic incentives for landholders to participate? How do these incentives vary with the landholding position in the watershed? What social or cultural attributes (including religious affiliation, age, wealth, land tenure or pre-existing cooperative groups) are correlated with watershed cooperation or defection? Research into these questions was conducted at the Save the Children Federation Watershed Management Project in Maissade, Haiti, which has followed a cooperative watershed management approach since 1988.

In 1986, the Save the Children Federation, with financing from the United States Agency for International Development (USAID), initiated a pilot integrated watershed management project in Maissade. Project planners combined two new, yet apparently successful, extension approaches. The first was the formation of groupements (peasant groups based on traditional social linkages, commonly engaging in collective social and economic activities and averaging eight members) for peasant mobilization and community development activities. Second, tree planting and soil conservation for economic benefit were to be promoted. Following two years of successful intervention at the individual farm level, the project initiated a small watershed treatment programme. The purpose of the programme was to encourage the voluntary treatment of small degraded watersheds (averaging 9 ha) and the creation of new watershed-specific management institutions.

Project extension agents promoted cooperative action by holding public meetings and making the normative claim that the status quo situation of transboundary erosion and independent action was insufficient and that the situation could and should be changed. No external incentives were provided to encourage participation, group members were not especially targeted by the extension agents and the extension agents did not lead group formation or activities.

FAO project support

The project Centre de formation en aménagement intégré des mornes" (Training centre for integrated watershed management) (GCP/HAI/011/SWI), funded through the FAO/Switzerland Cooperative Programme, has been in operation in Haiti since the early 1980s. Through applied research, training the organization of seminars and the distribution of information, the project has been instrumental in the design and promotion of soil and water conservation methods that focus on biological rather than physical measures and that farmers can easily adopt and apply in their own fields or in common areas.

After two years of activity in 22 watersheds, a total of 590 checkdams were constructed with an average of 27 per watershed. The dams were constructed on the land of 49 percent of all landholders and an average of three checkdams were constructed per landholding. Principal ravines received total treatment in ten watersheds, partial treatment was achieved in seven watersheds and only scant treatment was achieved in another five. The "totally treated" watershed category includes those in which the principal ravine is treated from the uppermost parcel to the most downstream parcel; the "partial" category includes those in which more than one checkdam has been constructed on more than one parcel; and the "scant" category includes those watersheds in which less than ten treatments have been installed on one or fewer parcels.

Fifty-four percent of all landholders participated, contributing labour, time and effort to watershed management. An average of 4.6 landholders participated per watershed and an average of 3.7 persons who did not own land in the watersheds also participated. The latter are referred to as "landless" participants in the following text (although they in fact may have owned land outside the watershed).

The first objective of the research described in this article was to gain a greater understanding of the factors associated with a person's choice to cooperate or defect in the collective watershed management activity. The second objective was to investigate the effect of resource scale and variable heterogeneity on the emergence of the collective watershed management institutions. Why was there a high degree of cooperation in some watersheds and not in others?

Various survey instruments were utilized to acquire information in a short period of time as well as to permit cross-referencing. These instruments were implemented with the assistance of Save the Children staff-agroforestry technicians and animators (peasant organizers) - during August, September and December 1990. Field data was compiled in database form, including 19 socio-economic parameters for each of the landowners of the 22 watersheds and for each of the 268 people studied: 101 landowners who participated, 85 who did not and 82 "landless" participants. The data were assessed in terms of selective individual incentives for participation and the conditions for collective action.

Factors associated with individual choice to cooperate

As indicated above, the first objective was to determine which types of people participate, which do not and why. As the role of "landless" participants became apparent, it also became imperative to understand who these contributors were and what incentive they had to participate in the watershed treatment.

To fulfil this objective, the following factors were compared between the participant (cooperator) and non-participant (defector) categories to determine differences and correlations with cooperation:

- Potential to receive a direct financial benefit from the output of the collective action: the installation of checkdams on a person's land. This factor is indicated by the landholding position in the watershed (sideslope, upstream, midstream, downstream) and the length of principal ravine on an individual's landholding.
- Whether or not the individual is a member of one of the groups.
- The manner in which a person acquires labour for major agricultural tasks: individually (*pou kont yo*); exchanging with others (*boukante maten*); via labour exchange groups (*asosye or combit*); or hiring day labour (*bay djob*).
- Whether or not a person has previously adopted contour soil conservation techniques on their own lands.
- Actual realization of a direct financial benefit from the output of the collective action: direct economic benefit. This factor is indicated by the location and number of checkdams constructed.
- Land tenure of an agricultural parcel held in the watershed: rented (*fem*); sharecropped (*demwatye*); owned (*tit, achte*); or undivided inheritance (*indivize*).
- A person's official religious affiliation (catholic or protestant).
- Whether or not a person regularly participates in indigenous folk religious ceremonies (voodoo).
- A person's wealth. This factor is indicated by four variables: the total number and size of land held and the number of cows and pigs owned.

- A person's age.

The first four factors were found to be significantly associated with individual choice to cooperate (i.e. $p < .05$). The analyses listed above indicated which variables were correlated with cooperation, but not the relative weight of each variable: to determine this, a logit model with a single binary response (cooperation or defection) was formulated. Thirteen models were tested, starting with the complete model. Variables with the lowest correlation with the response were successively dropped from the models considered. The model which included the group membership, conservation technique adoption and number of checkdams acquired provided the best fit of the models tested.

The data was then reorganized to investigate the factors affecting the emergence of cooperative institutions. The watersheds were divided into three categories of treatment achieved (complete, partial and scant) in order to represent three levels of cooperative activity. Test statistics were compared between categories to determine what conditions affected the level of cooperation.

Findings, discussion and policy implications

Factors associated with individual choice to cooperate

Not surprisingly, in the analyses of the correlation between various socioeconomic parameters and either cooperation or defection, parameters that indicated the potential for landholders to gain directly from cooperation were significantly correlated with cooperation. The majority of cooperators held agricultural parcels in the upstream and midstream positions while the majority of defectors held parcels in the sideslope and downstream positions. Cooperators also owned a significantly greater length of the ravine in which the soil conservation treatments were placed. Interestingly, holders of downstream parcels were by and large defectors. Research indicated that a significant number of downstream parcels were jointly held, which raised the transaction costs of benefit distribution and thus decreased the incentive to invest in the cooperative venture.

Constructing a brush checkdam

However, the analyses also indicated that cooperation was not associated with actual benefit, at least as measured by the study. Similarly, although cooperators tended to benefit more than defectors, defection did not preclude the installation of checkdams on the defector's property. Twenty-eight percent of all checkdams were constructed on property held by defectors. Anecdotal evidence suggests that the majority of these lands were upstream from cooperators' land, thus suggesting that downstream owners were protecting their investment by treating upstream land. Other analyses indicate that there was no significant difference in the amount of labour contributed between those who benefited and those who did not. In addition, almost 40 percent of all labour contributed to the collective activity came from individuals who did not hold land in the watershed. This may indicate that those who did not benefit within the time frame measured by the study might benefit either later or in some other way not measured by the study. For example, participants might have seen themselves as potential future leaseholders of these improved parcels.

Haiti's mixed and largely uncodified land tenure system is claimed by many watershed management professionals to be a major constraint to the adoption of soil conservation techniques and overall watershed rehabilitation. Undivided inheritance (*indivize*), rented (*fem*) and sharecropped (*demwatye*) lands (representing about 47 percent of all parcels in the watershed studies) are frequently defined as "insecure" tenures by external "experts" and thus are not seen as potential sites for soil conservation investment, despite the lack of valid research on the matter. However, the holding of so-called "insecure" tenures did not affect the

decision either to cooperate or defect. Participants and non-participants held the same percentage of the different land tenure types and checkdams were constructed on land irrespective of tenure. This would suggest that the local population did not in fact regard these types of tenure as insecure. In contrast, landholders of jointly held ravines, i.e. those on the border of two parcels, did defect to a significant degree. This tenure arrangement was not overwhelmed by local institutional assurance, which suggests that such an arrangement represents a limit to the effectiveness of the collective watershed management approach.

Indicators of wealth were not significantly correlated with landholder cooperation or defection in three out of four measures. Thus, wealth does not apparently reduce the incentive to cooperate. Rather, relative wealth corresponds to a greater ability to contribute, and such contributions might be an act of "leadership". Conversely, poverty may be a factor which causes non watershed holders to make contributions to the collective cause, despite delayed or uncertain returns, thereby creating a critical mass of labour contribution which may then be reciprocated. It is interesting to note that in cash-poor Haiti, labour is both the medium of exchange between farmers and the only asset that the poor can contribute to a collective effort. As anthropologist Murray (1977) noted, in Haiti "...the farmer's success in life entails not only the acquisition of land, but the systematic mobilization of the energies of other individuals as well.... Much of his behaviour will not be understood, however, unless his radical dependence on the labour of others is clearly perceived...."

Membership in group farmers' organizations was strongly correlated with cooperation while non-membership was strongly correlated with defection. In addition, the majority of "landless" cooperators were group members (90 percent). Similarly the majority of defectors either worked their land individually or hired labour, while cooperators tended to exchange labour to a much greater degree. The majority of "landless" cooperators also participated in labour exchange arrangements. These findings indicated that cooperators tend to be members of reciprocity-based social institutions while defectors are not, reflecting both individual preference and the assurance of reciprocated investment.

Newly constructed multiple checkdams in an eroded area

There was no difference in average age between cooperating and defecting landholders, but "landless" cooperators were significantly younger. This finding is understandable, as these participants also tended to be both poorer and members of labour exchange groups.

According to the logit model constructed to assess the relative weight of the parameters in their association with cooperation or defection, previous membership in a group had the strongest association with choice to cooperate, while previous adoption of soil conservation came second and the actual benefit of checkdams constructed on the landowner's land third. None of the other parameters discussed above were significantly correlated with cooperation at this aggregate level. This finding strongly indicates that the individual choice to cooperate is largely based on (in descending order) a person's:

- i) "group spiritedness" and assurance of a reciprocated contribution (facilitated by group membership);
- ii) knowledge of the significant value of the good being created through collective action [indicated by previous adoption of soil conservation]; and
- iii) the realization of an actual short term gain.

Conditions associated with the emergence of collective action

Watershed size, tenure type distribution, the number of years of activity and the number of landholders were not associated with the emergence (or the lack of) collective action. More

important, increases in these parameters (indicators of watershed heterogeneity) did not constrain collective action. In terms of watershed resources, only the distribution of parcel location (an indicator of potential for economic gain) was correlated with collective action. Collective action was facilitated by greater levels of potential for economic gain (indicated by increased numbers of parcels in the upstream and midstream positions). The social transaction costs of creating a new collective action institution only appeared to be worth bearing in cases in which the potential for gain far exceeded the cost. In short, when the externality is large enough, it is more worth internalizing (i.e. since the potential welfare gain is large).

Indicators of landholder heterogeneity (levels of wealth, age, religious preference, group membership) were not important constraints to the emergence of collective action. Increasing diversity did not lead to reduced levels of collective action. These findings suggest either that the population was relatively homogeneous in these parameters (at the level tested) or that a high degree of assurance existed in the community which overcame the risk and uncertainty associated with heterogeneity. In terms of landholder heterogeneity, only the percentage of landholders who had previously adopted techniques and the percentage of landholders who engaged in labour exchange arrangements were correlated with the emergence of collective action.

As these percentages increased, so did the level of collective action. These findings suggest that knowledge of the value of the collective objective (soil conservation) greatly increased the adoption of the collective watershed management innovation.

[Fertile sediment accumulates behind a strategically placed checkdam](#)

[An aerial view of small plot of common property \(demarcated by a living fence of Euphorbia sp.\) In the midst of inefficiently monitored public property In central Haiti](#)

It is noteworthy that, although group membership was the parameter most strongly correlated with individual choice to cooperate, it was not found to be correlated with the level of collective action. In fact, the lowest level of action was correlated with the highest level of group membership. This suggests that group membership is a necessary but not a sufficient condition for action. All the watersheds tested were apparently above the minimum level of group representation.

Groups and labour exchange units are the primary institutional norms of cooperative activity and are probably the primary facilitators of both the adoption and diffusion of the cooperative watershed management innovation. The strength of these indigenous institutions overrides population heterogeneity and the linkages based on physical proximity. A high degree of assurance over reciprocated contributions and reduced transaction costs permits members to make "leading" contributions to the collective, thus making these institutions the social basis for collective action and self-governance.

Conclusions regarding collective action

- i) Attempts to improve rural landscape management by encouraging the formation of self-organized and managed voluntary organizations, providing technical assistance for individual adoption of conservation practices and then encouraging voluntary collective action to manage watersheds appear to be modestly effective. Collective action groups emerged and successfully treated transboundary erosion in a majority of watersheds tested. Although no external incentives were necessary to spur action in these cases, external incentives might have been required to achieve treatment in all watersheds. Participants will voluntarily treat non-participant land. Twenty-eight percent of all checkdams were constructed on

non-participant land; this is the clearest indicator of the non-separability of watershed production.

ii) Individual choice to cooperate in collective action that yields a public good is conditional and best predicted by: prior membership in reciprocating social organizations, practical knowledge of potential gains from cooperation and some potential to gain from that action. The majority of cooperators did not gain (at least as measured by the study) within the two years of study. It was also clear that, given the right conditions, the poor will voluntarily contribute to collective action that provides a public good. This does not suggest irrationality, but a larger set of arguments and a longer period of time over which reciprocity is likely to occur.

iii) Indigenous, self-organized cooperative groups appear to be at the root of higher-level cooperative institutions and the supply of public benefits. Watershed and landholder heterogeneity did not constrain cooperation because the high degree of membership in groups and labour exchange units permitted a high degree of assurance concerning conformance to rules and reciprocity. In addition, the fact that all individuals - rich and poor - had scattered plots, engenders a uniformity of interest in watershed management.

iv) Individuals are not motivated solely (or perhaps even principally) by intended outputs of the collective action, but also by the benefits from participating in the process of action. Rather than thinking of a collective action institution as one that addresses a single 'public good' challenge, it is perhaps more appropriate to think of such an institution as a "bundle of opportunities", one which has the potential to provide different benefits to different individuals. Some individuals might cooperate in order to gain social prestige, others might cooperate in order to build up labour credits which would be reciprocated in a labour-scarce season, and still others might cooperate in order to reap short-term financial gains. Although the potential for an adequate level of financial gain is necessary for group initiation, these non-financial motivations may be more important (in terms of providing incentives and resulting in effort) than solving the original problem of public benefits.

Policy implications

i) Free riding is not a dominant strategy. On the contrary, individuals within and beyond the watersheds flocked to cooperate in the new collective activity. The cooperative watershed management effort represented an opportunity for wealth and reciprocated labour investments. The finding that cooperation is conditional on the expected behaviour of others contradicts a strong individualist assumption made by conventional policy and project interventions in Haiti (and other places).

ii) Short-term land tenure arrangements and others characterized as "insecure" by outsiders did not hinder the installation of either the soil conservation practices or the adoption of the watershed management activity. As stated previously, labour substitutes for cash as the primary medium of exchange between peasants, and access to labour in times of need is thus effectively more important than tenure or cash terms. This need for labour can compensate for potential disputes and social friction caused by an unfairly administered tenure.

iii) Although watershed-specific management groups are not always formed, complete ravine treatment is possible. In sum, different levels of net gain, watershed and landholder heterogeneity will result in different institutional formations. Resource management can be achieved despite watershed and landholder diversity

iv) External agents can more efficiently promote collective action to engage in publicly beneficial projects by indirectly facilitating self-organization rather than by transferring or imposing arrangements from the outside. Governments can use policy instruments such as regulations, taxes, subsidies or investments to "fill the gap" between the capability of local institutions and the level of contribution needed to supply the public good. Such an approach, although problematic in terms of monitoring, would be low-cost and would enhance local institutional capabilities to manage resources for sustainable development.

The treatment of upland watersheds in Haiti would be promoted by project and policy support of the spread of labour exchange arrangements and by the prior adoption of soil conservation treatments. Government support of group membership would also foment collective action. Labour exchange groups could be used as the basis for extension networks. Government oppression of groups and other local institutions reduces the ability of rural Haitians to manage their lands adequately and has an indirect but substantial negative impact on the rural environment.

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