LANDHOLDER COOPERATION FOR SUSTAINABLE UPLAND WATERSHED MANAGEMENT: A THEORETICAL REVIEW OF THE PROBLEMS AND PROSPECTS

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ABSTRACT

Despite national legislation and substantial donor investments, watershed degradation continues to threaten the sustained economic development and social welfare of millions of citizens in the developing world. Past efforts have largely concentrated on the physical rather than institutional aspects of watersheds, and have often relied on external incentives to coerce or persuade individuals to adopt conservation practices. In

contrast to this conventional "physical" perspective, watersheds can be considered as sets of vested interests (and social relations) within a physically defined space. In essence, watersheds are physically defined subsets of rural society. Actors with vested interests within watersheds are interdependent because of water flow across political boundaries. From this perspective, the achievement of watershed management is a question of social relations, and cooperation between individual actors. Though there is growing realization for an expanded role of local, cooperative institutions in watershed management, theories on how such institutions might be identified, evolve or be promoted are limited. Toward this end, this paper examines some of the theoretical aspects of landholder cooperation for watershed management: the socio-political setting of upland watersheds; the physical attributes of watersheds influencing cooperation; the nature of externalities and incentives in watersheds; and the economic and socio-cultural factors affecting the emergence of collective action units. The processes by which collective action groups actually form are also reviewed. The paper concludes with a synthesis of the prospects for landholder cooperation approaches, the appropriate role of policy and a proposed process for promoting such cooperation.

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THE PROBLEM: MANAGING TRANS-BOUNDARY WATER FLOW IN UPLAND WATERSHEDS

Rationale and Nature of Watershed Management

The Costs of Watershed Degradation

Watershed degradation threatens the sustained economic development and social welfare of millions of citizens in developing nations (FAO 1986). In the Asia region for example, about 65% of the rural population live and earn their livelihood in upland watershed areas (Doolette and Magrath 1990). Increasing human populations, inequitable land distributions, inadequate governmental support for upland agriculture, and the unintended side-effects of national economic policies foster inappropriate land use and increasing environmental degradation.

Inappropriate land use can set off a chain of on-site events: deforestation, soil erosion, declining crop yields, conversion to unproductive uses, increasing rural poverty, and accelerated out-migration. Land degradation thus weakens the agricultural sector, and the loss of agricultural revenue can negatively impact food supply and prices at the local and national levels. If agricultural exports are significant, inappropriate land use can worsen the balance of payments and thus national economic development. Though it is difficult to predict exact hydrologic responses to different land use activities, soil erosion also causes substantial off-site damage: the silting of water courses, dams and irrigation systems, further hindering economic development (Hamilton and King 1983). Rising costs of energy, water and food can result.

The Concept of Watershed Management

"Watershed management is the process of guiding and organizing land and other resource use on a watershed to provide desired goods and services without affecting adversely soil and water resources. Embedded in this concept is the recognition of the interrelationships among land use, soil, and water, and the linkages between uplands and downstream areas (Brooks et al. 1990b)."

The concept of watershed management can be applied to the full range of watershed dimension and problem type; from soil erosion in five hectare, peasant occupied, upland watersheds in Nepal, to toxic organic pollution in the 374,000 square kilometer Baltic sea, which crosses eight national boundaries. Watershed management might include agriculture, soil conservation and forestry activities, but it differs from these separate fields in recognizing and focussing on land use and its impacts on other watershed interests due to trans-boundary water flow. The fact that water flows downhill, and does so irrespective of political boundaries, is the central tenet of watershed management. The problem of coordination and cooperation is thus inherent to watershed management.

Government Responses to Watershed Degradation

Widespread soil erosion and related watershed degradation is a cause, symptom and result of underdevelopment, and comprehensive resolution often requires nothing short of fundamental social change (Blaikie 1985). Ingredients of that change include broad policy reforms to support the rural and agricultural sectors, expand service and manufacturing sectors, dissuade population expansion into fragile areas, and enforce land use regulations. These reforms are undeniably exceedingly difficult if not untenable undertakings in most developing countries today. Though some developing countries have enacted specific legislation aimed at protecting watersheds, few have been successfully implemented and have resulted in sustained upland management.

Japan is the only modern state to have established mechanisms in which upstream landholders who implement conservationist measures are directly reimbursed by downstream beneficiaries (Kumazaki 1982). Other nations (notably Colombia and Venezuela), have enacted legislation by which a portion of the profits from water generated services ("e.g." energy or irrigation water) is given to agencies entrusted with the conservation of watersheds providing those services (Hernandez-Bercerra 1991). Problems of identifying specific land use criteria and devising practical enforcement mechanisms, organizational weaknesses, and limited funding have hindered the enforcement of legislation (Brooks et al. 1990a).

Because of the widespread ineffectiveness of legislative approaches, most developing countries have taken a "project" approach to influencing land use in specific, fragile upland areas. When this approach is adopted, specific areas are targeted, and special governmental or non-governmental implementing organizations are established; usually with short-term multi-lateral donor assistance. A synopsis of this "watershed management project" approach and some lessons from experience follow.

Synopsis of Watershed Management Project Experience: Inadequate Consideration of Institutional Issues

Conventional Project Experience

Development planners have generally approached watershed management, and the design of watershed projects, from an engineering perspective, focussing on the physical linkages of soil, water and vegetation, and targeting select, degraded watersheds. Project decision-makers have generally promoted a select number of internationally standard mechanical structures for treating contiguous public and private lands, and are biased to the protection of off-site rather than on-site benefits (Unasylva 1991). Monetary or commodity incentives have often been used to encourage farmer participation and the adoption of conservation techniques. The general failure of watershed management projects of this character to result in sustained benefits, either on-site or off-, is now widely recognized (Blaikie 1985, Easter "et.al." 1986, Michaelson 1991).

Part of this failure for watershed projects to achieve sustained benefits can be explained by common weaknesses of the project approach itself: short-term funding; ties to political agendas; top-down design processes; and steadfast preoccupation with achieving verifiable and quantifiable project outputs. In addition, conventional projects have not, to a large degree, been designed with popular participation in mind and with benefit sustainability as a goal. Despite possible improvements in watershed management projects, it has perhaps always been ambitious to think that sufficient national and donor funds exist to attack widespread upland degradation when project sponsored treatment can vary between $200 and $2000 per hectare (Pierce 1988).

Inadequate Consideration of Institutional Issues: A Key Cause of Failure

There is growing consensus in the watershed management community that a disproportionate amount of emphasis on the physical rather than the institutional problems associated with watersheds is a major cause of project failure [note 1]. Further, it is increasingly realized that the sustainability of benefits generated during a project is a direct function of the sustainability of institutions participating in watershed management. In arguing for a new approach to watershed management, Easter and Dixon (1986) stated that

"Once people are seen as legitimate (although sometimes 'illegal') users of the watershed resources, they will become part of the solution rather than the problem. The recognition of the necessity of social-behavioral solutions to physical problems has led to the integrated, multi-disciplinary approach proposed...."

Similarly, in a recent evaluation of watershed development in Asia Doolette and Magrath (1990) found that:

"Discussions of watershed management are generally dominated by concern about physical linkages related to movement of soil and water within drainage basins. While the significance of the hydrologic cycle for water resource planning cannot be overstated, research and project experience, however, show that conventional approaches to watershed management have little effect. Often neglected in analyses of watershed management are political, economic and social linkages between upstream and downstream. Understanding of and intervention in these areas provide an under-exploited avenue to improve productivity and the quality of life of upland populations."

After examining numerous World Bank and other watershed projects, Brooks "et al." (1990b) stated that though physical linkages cannot be excluded,

"The practical means of achieving sustainable projects in watershed management, conversely, cannot ignore land tenure, institutions, and the culture of watershed inhabitants. More emphasis is needed on the development of human resources rather than infrastructure."

In his popular text on the political economy of soil erosion Blaikie (1985:88) also emphasized the importance of institutions:

"In summary, soil erosion problems can be analyzed in a framework of Chinese boxes, each fitting inside the other, The individual within the household, the household itself, the village of local community, the local bureaucracy, the bureaucracy, government and nature of state, and finally international relations all represent contexts within which actions affecting soil erosion and conservation take place. A specific analysis must identify these contexts and the relationships between them."

In brief, watershed management project evaluations have generally identified institutional weaknesses at three levels: 1) national ("e.g." inappropriate national economic policies, funding commitments, or a lack of government agency coordination); 2) project ("e.g." lack of integrating local institutions, concerns or linkages into project planning and management); and 3) local ("e.g." failure to recognize and effectively promote cooperation between watershed landholders) (after Brooks "et al." 1990a).

Upland Landholder Cooperation: One Potential Solution [note 2]

There is a need for the management of upland watersheds, both for the protection of on-site and off-site interests. Approaches to achieve this management should meet at least the following criteria: 1) the approach must result in sustained and diffused upland management; 2) the approach must be affordable enough to impact large areas (or at least require limited donor capital); and 3) the approach must be politically and socio-culturally appropriate. Legislative and conventional project approaches have frequently not met the above criteria. Voluntary upland landholder cooperation, either promoted at national or project levels, could meet the above criteria and is thus one potential solution to watershed management problems.

Many authors and development workers have cited the need to recognize and empower local, indigenous groups into natural resource projects. Several authors, notably Dani and Campbell (1986) and Bochet (1986) have explicitly and thoroughly treated the subject of local participation in watershed management activities. Fewer authors have specifically proposed the promotion of collective landholder action for treating watershed lands which are common to them.

Cernea (1989) has called for watershed management approaches which form "watershed groups" (groups of farmers based on land ownership within watersheds) to establish and maintain watershed and forestry treatments. In a similar vein, Murray (1990) has promoted the establishment of "hillside units" of Haitian farmers to collaborate on the treatment of contiguous watershed lands. Uphoff (1986) also recommends the recognition and promotion of local groups for watershed management. McKean (1984 in Dixon and

Easter 1986) states that the though limited, the literature from Japan shows that collective management is capable of assuring stable and productive use of watersheds over a long period of time. None of the above authors has explicitly proposed methods

to form such groups, or discussed requisite incentive structures for farmer participation.

Gibbs (1986) also concluded that watershed projects should adapt their methods to reflect customary institutional arrangements, and create incentives for local groups to participate in watershed management activities. Rocheleau and van den Hoek (1984) described a project where landholders of a small watershed were encouraged to cooperate on the installation of agroforestry treatments for watershed management. No follow-up reports which indicate the effectiveness of the project or sustainability of the activity are publicly available. Perhaps the most concise and explicit call for research into landholder cooperation for watershed management is found in Brooks "et al." (1990)a:

"What is needed is basic research to identify possible mechanisms to promote cooperation among watershed residents and users, and the development of practical systematic methods for identifying possible mechanisms on a case by case ("i.e.", project) level. In this context it would be appropriate to look at both traditional and current patterns of political and social organization, particularly labor exchange, among the various groups concerned, patterns of interaction among those groups and between them and government officials, and the relative success (or lack of it) of previous attempts to promote cooperation within watershed areas."

In sum, there is consensus in the literature for the need of an expanded role of local, cooperative institutions in watershed management, but theories concerning such institutions, how they might be identified, evolve or be promoted are limited. Before advancing this discussion of landholder cooperation for watershed management, it is necessary to analyze the unique attributes of watersheds. What is it about watersheds that influence the landholder cooperation? How would collective action for watershed management differ from collective action for common property management, for community development, for irrigation, or for agricultural tasks on private land?

THE SETTING: ATTRIBUTES OF UPLAND WATERSHEDS AFFECTING LANDHOLDER COOPERATION

Socio-political Setting of Upland Watersheds

Rural areas in developing countries are generally characterized by relative poverty, a dependence upon the local agriculture and natural resource base, and a high degree of uncertainty concerning income (Runge 1986). The folk of upland watersheds are often disproportionally disenfranchised because they are frequently of different cultural heritage (and social system) than lowland folk, of low relative population density, and are physically isolated from lowland, modernizing societies (Lovelace and Rambo 1986). Dani (1986) describes the status of the Hindu

Kush people in terms of "alienation, annexation, and underdeveloped." These people are cognitively alienated from the urban-based political forces which control their lives, and often materially alienated from their own resources because of nationalization of property or elimination of customary tenurial arrangements. Because of their perceived underdevelopment, these people and their lifestyles are usually annexed ("i.e." incorporated) into the more powerful lifestyles of downstream society.

Though perhaps uniformly isolated from centers of authority, the people of upland watersheds are certainly not a homogenous group.

It should be recognized that communities inhabiting watersheds are composed of individuals who can vary greatly in many characteristics and who may or may not interact (Cernea 1989).

Physical Attributes of Watersheds and Related Externalities

Strictly speaking, a watershed is topographically delineated area that is drained by a single water course system. The fundamental tenet of a watershed is that water flows downhill. The watershed is thus a functional unit established by physical relationships where upstream land use can incite a chain of environmental impacts affecting downstream areas. Another key characteristic of watersheds is that they hold multiple, interconnected natural resources: soil, water and vegetation. Impact on one resource invariably affect the status of others.

Watershed management differs from forestry, agriculture and water development activities because it explicitly acknowledges and embraces the physical linkages between these resources (Brooks "et al." 1990b). These physical relationships only become an issue when individuals have vested interests in a watershed or a portion of a watershed ("i.e." it is populated, or valued by external agents), which is usually the case in developing countries. These vested interests are separated by political boundaries or institutional arrangements which normally do not correspond to the topographic limits of watersheds (see Figure 1.). The corollary to the "water flows downhill" tenet is the fact that it does so irrespective of political boundaries. The trans-boundary water flow is essentially an asymmetrical externality [note 3], and can be either positive (adding to the value of downstream areas) or negative. Thus in addition to the watershed being a functional unit for physical reasons, the watershed is a functional unit of multiple and interdependent vested interests.

Examples of negative trans-boundary externalities include: sediment, unimpeded surface water flow which causes sheet and rill soil erosion, unregulated storm flows, reduction of downstream flow due to diversion of water upstream, floods, mass wasting, and polluted water of inadequate or dangerous quality. Examples of positive externalities which derive from upstream watershed treatments include regulated water flow which reduces crop damage, sufficient supplies of irrigation water, improved water quality, and decreased sediment loads.

Landholder exposure to externalities is predominantly a function of their location in the watershed. As illustrated in Figure 1., most of the upstream landholders (a, b and d) are not impacted by the land use of others. Midstream landholders (c, e, g and h) are impacted by upstream actions, and the holder of the most downstream position (i) is the most vulnerable of all. Landholders e and g would be impacted by f's land use due to surface flow of water and or soil. Similarly, i could be impacted by surface erosion from g and h as well as gully erosion produced by all upstream holders.

In sum, when assessing the potential for watershed management, two key elements should be considered: 1) the vested interests are asymmetrically interdependent ("i.e." upstream activity affects downstream value); and 2) a degree of uncertainty (behavioral and physical) exists as to the impact of this interdependence ("i.e." downstream owners are uncertain of upstream owner behavior and of the physical impacts of that behavior). Different actors are also exposed to different uncertainty and risks dependent upon relative position in the watershed and nature of the resources held.

LANDHOLDER COOPERATION FOR WATERSHED MANAGEMENT: A REVIEW OF RELEVANT LITERATURE

Incentives and Conditions for Collective Action

The author's thesis is that, in contrast to the conventional "physical" perspective, watersheds should be considered as sets of vested interests (and social relations) within a physically defined space. In essence, watersheds are physically defined subsets of rural society. Actors with vested interests within watersheds are inter-dependent because of trans-boundary water flow. From this perspective, watershed management is a question of social relations, and cooperation (or coordination) between individual vested interests. This gives rise to other questions:

What incentives are necessary for individual action?; What conditions are necessary for cooperation to occur?; and What role could governments and projects have in fostering coordination or collective action between individuals with interests in watersheds?

The literature on cooperation, incentives and mechanisms for collective action is immense and diverse. Only that which is most relevant will be highlighted here. Early scholars (Gordon 1954, Olson 1965, and Buchannan and Tullock 1962) examined cooperation and collective action from a logical, atomistic perspective as it applied to political decision and public goods.

They generally emphasized the individual's incentive to maximize individual returns or to "free ride". Land economists have examined these issues for a number of years, but the majority of literature concerning collective action and resource use followed

the publication of Garret Hardin's famous article, "The tragedy of the commons" (1968). Succeeding studies have since dispelled his thesis that individual rational use of common resources inevitably leads to socially irrational results ("i.e." resource degradation) (McCay and Acheson 1987, Ostrom 1988, Runge 1984, Uphoff 1986, Wade 1987.

These scholars and others learned that in the real world, when faced with the degradation of a critical and jointly used resource, communities often create institutional arrangements to preserve the resource and sustain their livelihoods (Uphoff 1986). The result of such institutional arrangements is what has come to be termed a "common property resource" (Wade 1987). Axelrod (1984) contributed to the debate by testing cooperative behavior with a computerized Prisoners Dilemma game and found that the Tit for Tat strategy (cooperation based on reciprocity), rather than defection ("i.e." "free riding") dominated in long-term play. Scholars such as Elinor Ostrom (1985, 1986, 1988, 1989, 1990) have intensified research into resource topology, incentives for collective action, and institutional arrangements for resource management.

The trans-boundary water flow externality found in watersheds creates conditions for collective action analogous to those found in common property resource and irrigation system management situations. The physical attributes of watersheds and common property differ and thus the nature of the externalities differ.

In watersheds the externality is asymmetrical (unevenly impacting landholders), and in common property situations the externality is symmetric (evenly affecting all holders). Irrigation systems are more alike the watershed case in that the externalities are asymmetrical. Watershed externalities are both more complex and greater in number because of the potential for surface flow and other vegetational impacts. Nonetheless, the literature concerning institutional arrangements for common property and irrigation management can be adapted to the watershed coordination problem.

Economic Factors Inducing Landholder Cooperation

Many economic and socio-cultural variables might induce an individual to participate in collective action for watershed management. In essence, the economic incentive for landholder cooperation derives from the fact that if landholders coordinate land use, then each can operate to optimize their land's productivity. Since their productivity is impacted by upstream action, it is in their interest to influence upstream landholder's behavior. A failure to cooperate results in a Pareto-inferior outcome ("i.e." an outcome that is the least preferred by landholders of all potential outcomes). The degree to which each landholder is affected by other landholder's behavior determines their incentive to cooperate. There is thus a potential for net individual and social gains with cooperation.

This potential for gain induces the establishment of institutional arrangements which control land use.

In economic terms, the trans-boundary water flow is a good that is jointly supplied to watershed residents and jointly consumed by those residents. It is this physical jointness which causes interdependence. The physical nature of the watershed results in the fact that only the landholder in the most upstream position is not dependent on the land use of other landholders. The most upstream landholder though is not beyond interdependence as downstream holders are dependent on their action. Midstream and downstream residents are affected by the flow whether they like it or not, and can influence the upstream owner to alter their behavior. There is also a degree of non-excludability of actors.

Downstream landholders can benefit from upstream treatments whether they cooperate in the activity or not. This is a case of a "free rider" problem. Watershed residents can operate as they wish concerning land use, and can not be excluded from the benefits of the water resource.

Figure 1. Schematic of a watershed with nine landholders.

>From Figure 1., landholder i clearly has the greatest incentive to induce watershed treatments because of his/her location, while holders a, b, and d are more favorably situated. If c and e (who are the most exposed to gully erosion) decide to install treatments to reduce erosion, then all those downstream (g, h, and i) will benefit. If they do so without assisting c and e to establish the treatments, then they are essentially "free riding". Depending upon slope and land use characteristics, f (though downstream from b) may not have sufficient incentive to cooperate on upstream treatments. Similarly, as the water course forms the property boundary between g and h, neither might have sufficient incentive to cooperate on upstream treatments.

Resource economists who have studied questions of property rights

and externalities have concluded that resource use and externalities are inextricably connected and ubiquitous, and that institutions naturally evolve to regulate these externalities (Dragun (1983), Schmid (1988), Russel (1982)). Hayami and Ruttan have taken this analysis a step further and identify changes in factor prices or resource endowments as the fundamental inducement for an institutional innovation (Hayami and Ruttan 1985). For example, if rice prices suddenly doubled and if the watershed were treated, it could produce rice, landholders would suddenly have greater incentive to cooperate on the treatment. Other incentives for landholder cooperation are that watershed treatment increases the security of expectations concerning watershed resources, and participation in group activities provides a hedge against individual failure (Runge 1981).

In considering incentives for collective action Runge (1981 and 1986) stated that ultimately an individual's interest in collective action is a question of assurance. Are the individuals assured that their action will be reciprocated by others ("e.g." will their investment in the collective activity be met by the others concerned)? His research indicates that "cooperative institutional rules are endogenous adaptive responses to the problem of uncertainty about the expected actions of others" and that social rules generally govern

assurance meaning that strong social pressure would discourage "free riding" (1981). This of course would be dependent upon the cultural and social arrangements in each specific watershed area.

Dixon and Easter (1986) found that "One of the key components for developing institutions for watershed management is to devise institutions which minimize transaction costs of collective action".

In examining the institutional aspects of irrigation system management, Bromley et al (1980) describe the difference between nominal location and real location of landholdings along the irrigation system. Though a downstream landholder has an unfavorable nominal location, if this holder has substantial political power in the local community then they have a favorable real location. This critical insight has direct relevance to watershed management. Though location might impact the holders incentive to act towards collective action, the key factor affecting management is the ability and will to act.

In sum, degrees of supply jointness, excludability and risk exposure are a function of slope, soils, land use, location in the watershed and the water flow characteristics. These variables, along with relative factor prices, affect the economic incentives for any and all actors to induce collective action.

Summary: Factors Affecting the Emergence of Landholder Cooperation

Some of the economic factors inducing landholder cooperation have been described in the previous section. These and other socio-cultural factors which would positively affect the emergence of formal or non-formal cooperative arrangements have been summarized below.

Economic Factors:

1) the size of potential individual and social gain from cooperation ("i.e." perceived individual and social gains exceed individual and social costs);

2) costs and benefits from cooperation are fair and equitably distributed; and

3) transaction costs associated with establishing and maintaining cooperative action are low (these would be lower if collective arrangements already existed among watershed landholders) (after Gibbs 1986).

4) upstream and downstream landholders are not exposed to substantially different levels and frequency of watershed externalities (after Ostrom 1985).

Socio-cultural Factors:

1) the stability, homogeneity of landholders ("e.g." landholders are not strongly divided by: conflictive use patterns, perceptions of risk, social antagonisms);

2) the personal interests of rural elites is enhanced or at least not compromised by watershed cooperation activities (after Chambers "et al." 1989);

3) community ability to communicate and enforce rules of cooperation is strong;

4) landholders have previous cooperative experience (after Runge 1986);

5) landholders are willing to adopt conservationist practices (a function of land security, productive value of the soil, capacity to invest time and labor in adoption, and natural attitude toward risk and innovation;

6) scale of social penalties and sanctions is sufficiently high to discourage "free riders" (Ostrom 1990); and

7) other cultural factors related to cooperation exist ("e.g." cultural disposition to cooperation, solidarity, conviviality and other forms of "social euphoria" (Fernandez 1987)).

8) the number of landholders in the watershed is relatively small, or the number or political weight of those who intend to cooperate is sufficient to overcome resistance (i.e. a "critical mass");

9) the size of the watershed is relatively small, or the cultural and jurisdictional boundaries and watershed conditions are sufficiently known and clear to inhabitants;

10) watershed location: watershed isolation or remoteness helps in retaining mutual obligations (after Chambers et al. 1989); and

11) landholder residences are in close proximity to land or interests held in the watershed.

Processes: How Collective Action Institutions Actually Emerge

By what process might a group of landholders initiate cooperation for the treatment of their watershed? How do collective action institutions actually emerge? Answers to these questions assist us in understanding spontaneously generated cooperation for watershed treatment, and in devising development strategies which promote such behavior.

Ostrom (1985) proposed that for a collective action institution to evolve, resource users must have a common understanding of the problem and of the alternatives for coordination, and have a common perception of mutual trust and reciprocity, and decisionmaking costs should not exceed the benefits of cooperation. Ostrom (1985) also made the following general propositions concerning the emergence of collective action groups with respect to a common property resource (CPR):

"Individuals will tend to switch from independent strategies for exploiting a CPR to more costly, coordinated strategies when they share a common understanding that:

- Continuance of their independent strategies will seriously harm an important resource for their survival;
- Coordinated strategies exist that effectively reduce the risk of serious harm to the CPR;
- Most of the other users of the CPR can be counted to change strategies if they promise to do so; and
- The cost of decision making about future coordinated strategies is less than the benefits to be derived from the adoption of coordinated strategies."

After studying social movements and collective action on public goods, anthropologist Gerlach (1990) developed the following six-step process by which trans-boundary interdependencies become institutionalized:

1) definition of the resource of concern (biophysical relationships);

2) definition of resource users (socio-cultural relationships);

3) definition of the interdependencies of the users (resource jointness and externalities);

4) building claims of rights, duties, privileges and obligations of resource use;

5) building assurances between users with sanctions and enforcement mechanisms; and

6) building structures for coordination of resource use.

Another informative set of literature relevant to the process of watershed landholder cooperation is that on resource regimes. This literature provides a framework for understanding how individuals (groups or nations) can cooperate on problems which cross their common boundaries in ways other than through the free market or centralized command (Gerlach 1989). Regimes essentially evolve when a critical mass of impacted individuals develop consensual knowledge concerning the trans-boundary problem and potential solutions to that problem, and is an reflection of common purpose (Lipschutz 1989). Young (1985) identifies three types of regimes: spontaneous, negotiated, and imposed. Language is an example of a spontaneous regime, the United Nations system an example of a negotiated regime, and colonial hegemony an example of an imposed regime.

The pre-existence of local institutions which are directly impacted by the trans-boundary problem facilitate the formation of regimes. For example: it might be more efficient (and effective) for Ducks Unlimited Minnesota and Ducks Unlimited Manitoba to establish and enforce hunting rights to migratory fowl, than for the central governments of Canada and the United States to formally negotiate regulations and policing mechanisms.

Similarly, the United Nations might be more effective in resolving trans-boundary disputes had it been formed as an international extension of pre-existing, national social justice groups rather than as a totally new institution. Such regimes composed of pre-existing institutions would be efficient because of mutual consensus concerning purpose, and low transaction costs associated with local organizations. Such regimes have evolved spontaneously and indicate that such a process could occur for watershed management.

CONCLUSIONS: PROSPECTS FOR SUSTAINABLE UPLAND WATERSHED MANAGEMENT

The Potential for Landholder Cooperation

There is a great and widespread need for the management of upland watersheds in many developing countries, both for the protection of on-site and off-site interests. Because of the widespread ineffectiveness of legislative approaches to watershed management, most developing countries have taken a "project" approach to influencing land use in specific, fragile upland areas. These projects have, by most reports, usually failed to achieve sustained watershed protection. Watershed management project evaluations have generally identified an inadequate concern for institutional issues as a major cause of project weakness. These institutional issues occur at three levels: 1) national ("e.g." inappropriate national economic policies, funding commitments, or a lack of government agency coordination); 2) project ("e.g." lack of integrating local institutions, concerns or linkages into project planning and management); and 3) local ("e.g." failure to recognize and effectively promote cooperation between watershed landholders) (after Brooks "et al." 1990a).

The inadequate concern for institutional issues is due, to a large extent, to the conventional preoccupation with the physical relationships within watersheds. The author's thesis is that, in contrast to the conventional "physical" perspective, watersheds should be considered as sets of vested interests (and social relations) within a physically defined space. In essence, watersheds are physically defined subsets of rural society. Actors with vested interests within watersheds are inter-dependent because of water flow across political boundaries. >From this perspective, the achievement of watershed management is a question of social relations, and cooperation (or coordination) between individual vested interests. These vested interests are separated by political boundaries or institutional arrangements which rarely correspond to the topographic limits of watersheds.

When assessing the potential for watershed management, two key elements should be considered: 1) the vested interests are asymmetrically interdependent ("i.e." upstream activity affects downstream value); and 2) a degree of uncertainty (behavioral and physical) exists as to the impact of this interdependence ("i.e." downstream owners are uncertain of upstream owner

behavior and of the physical impacts of that behavior). Different actors are also exposed to different uncertainty and risks dependent upon relative position in the watershed, social affiliation, and nature of the resources held.

These dilemmas must be understood and overcome by local peoples in order to achieve sustained management. In this light, sustained watershed management is a "conceptual" rather than a "physical" innovation, and can only be achieved if the conceptual innovation of coordinated land use for individual and social gain (i.e. watershed management) is adopted by permanent local institutions. Sustained watershed management then is the collective adoption of the concept of coordinated land use. It is not necessarily signaled by the expedient adoption of specific, physical treatments.

Approaches used to promote watershed management should meet at least the following criteria: 1) the approach must result in sustained and diffused upland management; 2) the approach must be affordable enough to impact large areas (or at least require limited donor capital); and 3) the approach must be politically and socio-culturally appropriate. Voluntary upland landholder cooperation, either promoted at the national or project level, can meet the above criteria as:

1) mid- and downstream holders have natural economic incentives to act for coordinated management, and these holders can exert social pressure on upstream actors to conform;

2) the creation of new institutional arrangements to preserve and sustain individual livelihoods is a natural social response to externalities, and these extensions of pre-existing social arrangements are sustainable;

3) the formation of these natural social responses, in the form of new institutions and social arrangements can be stimulated and facilitated by external forces;

4) pre-existing trust, consensual knowledge, reciprocated action, and social sanctioning mechanisms facilitates the collective adoption of the watershed management innovation;

5) once the conceptual innovation of coordinated land management is adopted by permanent institutions in one locality it can spontaneously diffuse to other watersheds via established social linkages;

6) landholders can tailor cooperative arrangements to local socio-cultural patterns; and

7) diffusion of the watershed management conceptual innovation may be slow and irregular, but it could be less expensive than conventional investments in targeted mechanical treatments.

A Framework for Action

Development agents should begin with the premises that: for upland watershed management to be sustainable it must be an

extension and an incremental transformation of existing social relationships; this extension of relationships can be stimulated (but not forced) by external agents; the character of the cooperative arrangement must be authored by local inhabitants in order to mesh with existing social standards and priorities; and, this extension can be achieved by dialogue with individual landholders and local institutions.

As government policy and political will impact decisions made by local individuals and institutions, governmental support, even if rhetorical, could indirectly facilitate the formation of landholder cooperation units. By providing a climate conducive to cooperation, and the appropriate information concerning interdependencies and optional forms of cooperation, watershed "regimes" could spontaneously form. Specific state level action might include: high political exposure to the problem and options; educational radio campaigns; general support for popular organizations and inter-organizational exchanges; tax relief or additional development assistance to a watershed adopting cooperative treatment, or training sessions by government extension services.

Projects targeting specific watersheds could use intensive approaches which either encourage the formation of new cooperative institutions, strengthen existing ones, or facilitate inter-institutional coordination. The role of the project would be to initiate inhabitant discussion of watershed problems and possible actions. More specifically, agents should stimulate landholder cooperation along the lines of the natural processes examined by E. Ostrom and L. Gerlach. The project should not develop rigid and complicated plans which compromise local participation and authorship of the cooperative arrangement. A rough synopsis of the proposed process follows:

1) The first step should be project diagnosis of the economic incentives for cooperation, overall costs, and overall benefits with local representatives. Before proceeding, the project should assure that the potential benefits of cooperation exceed the expected decision-making and other inhabitant input costs.

2) Agents should then identify watershed landholders, and institutions to which they belong ("e.g." labor exchange, kin, marketing, religious), and linkages within and beyond the targeted watersheds.

3) The next steps would be to enable landholders to reach consensus concerning the costs and distribution of watershed problems. This consensus should correspond to the recognition of landholder interdependency and a common understanding of the various alternatives to achieve coordinated land use. Towards this end the project could sponsor meetings where watershed inhabitants debate these issues.

4) If inhabitants reach consensus concerning the problem and agree to act cooperatively, then the next step would be the establishment of the collective action institution. This institution could be formal or non-formal, and would include the building of rights, duties, and sanctions to discourage "free riding". These institutional rules could be either implicit or explicit dependent upon the socio-cultural setting.

NOTES

1. In this text the term "institutions" refers to both institutional arrangements ("i.e." defined rights and responsibilities among individuals and groups), and organizational arrangements ("i.e." purposive, ordered groups of individuals) (Gibbs 1986).

2. The phrase "landholder cooperation for watershed management" refers to cooperation on watershed management activities between individuals who own or operate on contiguous lands within the same watershed. The term "cooperation" is used in this text to mean "an organizational relationship in which joint action is undertaken to achieve individual operating goals" (West "et.al." 1990:105).

3. The term externality applies to situations in which the actions of one individual or firm create costs or benefits for another entity, but the individual or firm does not consider these costs or benefits when making decisions about their own action (Russel 1982).

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