



Participation, pluralism and polycentrism: reflections on watershed management in Costa Rica

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In the polycentric ideal, the organizational scales of the supplier of public goods, the consumer and the political community governing supply and production all coincide.

A recent issue of *Unasylva* (Vol. 49, No. 194, 1998) on the theme "Accommodating multiple interests in forestry", summarized the findings of the Workshop on Pluralism and Sustainable Forestry and Rural Development, hosted by FAO in December 1997.

The present article contrasts the *Unasylva* discussion of the concept of pluralism with the notion of "polycentrism", developed by Vincent Ostrom and his colleagues at Indiana University in Bloomington, Indiana, United States. The article goes on to discuss some practical expressions of the polycentrism concept as seen in a recent study on watershed management in Costa Rica.

PLURALISM, PARTICIPATION, LEGITIMACY AND LEGALITY: THE UNASYLVA ISSUE ON PLURALISM

Pluralism, as described by Anderson, Clément and Crowder (1998) in the overview article of the *Unasylva* issue, involves "distinct groups [that] are actively autonomous and independent, but often interdependent". It is assumed that "conflicts [among these groups] are inevitable and cannot be (permanently) resolved. At best they can be temporarily managed." This requires responsible interrelationships as well as empowerment, with "equity among groups in decision-making power". "A separation of powers and a system of checks and balances are needed to avoid the inefficiencies and abuses of monopoly in management."

These reflections on empowerment and the separation of powers shift the pluralist focus from a reactive mindset to a proactive approach, a transition in which the authors address the promulgation of a legal framework where pluralism can flourish. They discuss the need for at least three types of organization - government services, local groups and communities, and non-governmental organizations - and the stimulus of mechanisms such as decentralization, privatization, participation, rural markets, resource management contracts, territorial charters and codes of conduct.

In an article on law, pluralism and sustainable community-based forest management, Lynch

(1998) advocates a strengthening of civil society through express measures that ensure rights to: obtain information; express opinions; participate in decision-making activities; associate with others; register legally as organizations; open and secure bank accounts; and hold property. He sees the recognition of community-based rights by means of "an adequate legal regime that recognizes the role of, and allows, local community-based institutions to define, preside over and redefine the rules of resource use" as equally important. Furthermore, it is deemed imperative to "create and foster appropriate legal, regulatory and economic relationships between local communities, formal governmental institutions and, in some instances, commercial enterprises".

THE CONTRIBUTION OF OSTROM AND HIS COLLEAGUES

The pluralist approach outlined above contrasts with the concept of "polycentrism", first elaborated by Vincent Ostrom and his colleagues in the 1950s in response to the problems of provisioning the vast metropolitan areas of the United States with public goods and services.

At a time when it was fashionable to deplore the overlapping or duplication of functions carried out by the myriad federal, state, county, city and special district agencies that govern the vast American metropolises, and when urban reorganization under a single umbrella was the usual recommendation, Ostrom, Tiebout and Warren (1961) put forth the view that a myriad political jurisdictions could in fact function coherently under a "polycentric political system".

In the theory of polycentric order, "individuals are the basic unit of analysis" (Ostrom, 1994). "The fundamental authority of persons establishes one's authority to govern one's own affairs. Such authority is accompanied by correlative limits upon the authority of specialized instrumentalities of government. The latter are constituted by multiple agency relationships that manifest a division of labour in the exercise of authority relationships applicable to rule-making (legislative authority), rule enforcement (executive authority) and monitoring performance (accounting, auditing, and investigative authority). No supreme authority exists; all authority is subject to challenge. Binding authority depends on concurrence among multiple decision structures".

In this context, affirms Ostrom, "individuals will occupy positions where decisions are taken on behalf of the interests of others in the exercise of agency and trust relationships. Business firms, units of government, agencies of government, legislative bodies, political parties, courts, and nation-states may also be used as units of analysis having to do with relationships at incremental levels of analysis.

Societies then become richly nested assemblages of associations that include the diverse forms of association developed within and among units of government. Diverse autonomous units can then be subject to analysis in relation to specifiable rules of association".

Dynamics, costs and benefits of polycentrism

In Ostrom's view, patterns of polycentric management are applicable to public as well as to mercantile economies, to governing systems featuring a separation of powers and a series of checks and balances, and to the patterns of international order. Here it is fundamental to distinguish the various goods and services according to the categories of exclusion and rivalry in consumption (Ostrom, Tiebout and Warren. 1961; Ostrom and Ostrom, 1977; Ostrom. Gardner and Walker, 1994). In this analysis, a gradation from the purely private to the purely public is observed.

In the case of private goods, for which both rivalry and exclusion are very much in evidence, "the viability of any polycentric order depends upon the maintenance of appropriate limits", particularly concerning oligopolistic contractual formulas affecting the free play of market supply and demand.

In the case of public or quasi-public goods - which include many common-access natural resources such as forests - exclusion and rivalry occur to a much lesser degree. This implies a need for non-mercantile supply solutions and financial mechanisms to keep down production costs for the benefit of the consumer.

In this scheme it is possible to envision each public good being matched by an appropriate scale of public organization (Ostrom, Tiebout and Warren, 1961). There are three elements of scale:

- the unit of government supplying a public good, i.e. the scale of formal organization;
- the public, consisting of all those affected by the supply of the public good;
- the political community, i.e. all those actually intervening in the decision to supply the good.

The authors hold that ideally (assuming the criteria of responsible democracy) all three scales would coincide. But, since the number of units of government is limited compared with the number of public goods to be supplied, a one-to-one relationship among the public, political communities and formal public organizations is not practicable. As a result, the authors point out, "public organizations may (1) reconstitute themselves; (2) voluntarily cooperate; or, failing cooperation. (3) turn to other levels of government in a quest for an appropriate fit among the interests affecting and affected by public transactions".

The second option, voluntary cooperation, is fairly easy to resolve as some sort of contractual arrangement. The remaining two options, however, are somewhat problematic and complex in terms of competition, conflict and conflict resolution. A polycentric political system is only viable to the extent that it can resolve conflict and maintain competition within acceptable bounds.

Checks on the performance of local units of government are pivotal to keeping competition within acceptable bounds. Separating the provision and the production of public goods and services is another favourable mechanism. In this respect, local governments can act as consumer associations, channelling demand to those producers of public goods and services offering the most competitive terms.

Unequal distribution of the costs and benefits of public supply presents the most fundamental challenge to conflict resolution and management. Efficient government mechanisms are necessary to internalize the problem (including the provision of sanctions to enforce any decisions taken). Recourse to the law courts is primary here. Since cases brought before the court are defined by the litigants, there is a minimal risk of external control by a higher authority. Another basic recourse is informal negotiation, whereby differences are subordinated to the goal of not losing local autonomy to a higher level of government.

PLURALISM, POLYCENTRISM AND WATERSHED MANAGEMENT IN COSTA RICA

Twentieth-century Costa Rican policies governing management of natural resources and the environment arose in the context of a bureaucratic, heavily centralized and top-down organization of state institutions and mechanisms linking the institutions to their users.

Recent trends, however, suggest that the centralistic bias is now undergoing a process of evolution. The enhanced recognition of the importance of forests as suppliers of natural resources and environmental services, for example, has engendered some major changes. A growing awareness of the pivotal role of watersheds in generating hydroelectric power and in

controlling river, aquifer and coastal-area contamination has led to the launching of watershed commissions throughout the country. These bodies, which have governmental, non-governmental and local participation, have the role of defining joint action programmes.

Several other major institutional innovations are also pointing in the direction of pluralism and perhaps even polycentrism. Since 1988, the National Parks Service, Forest Service and Wildlife Department have been unified under the National System of Conservation Areas (SINAC). This system divides Costa Rica into 11 decentralized natural resource management and protection zones, with an institutional framework for involving local municipalities and private sector groups in policy design and implementation.

The new 1996 Forestry Law established the National Forestry Office. This body, designed to coordinate forestry policies, includes representatives from both the governmental and non-governmental sectors, including conservationist organizations and small-scale reforestation agencies.

The general impact of these initiatives is to widen the participation of a growing number of stakeholders in the planning and implementation of natural resource management policies, particularly for forests, conservation areas and watersheds. The possibility of advancing towards a polycentric horizon, where -in the terms of Ostrom and his colleagues - the organizational scales of the supplier of public goods, the public consuming these goods and the political community governing their supply and production all coincide, depends on the concomitant development of a solid supporting institutional and legal framework.

The following sections examine the recently concluded case study of the Arenal watershed (Aylward *et al.*, 1998; Aylward and Fernández-González, 1998) to analyse the extent to which the three scales of organization coincide in the form of concrete units supplying public goods and services. The analysis also questions whether the functioning of these concrete units in terms of cooperation, competition and conflict resolution has or has not contributed to the rise and consolidation of a polycentric political system.

[Watersheds have a pivotal role in generating hydroelectric power and in controlling contamination of rivers and downstream sedimentation](#)

The Arenal watershed

The Lake Arenal Watershed, with a total area of 41 000 ha, is located in northern-central Costa Rica on the Atlantic slope of the continental divide (see Map).

The area, which has been occupied by cattle ranchers since the 1940s, emerged to occupy a strategic role in the national economy with the construction of a 9 300 ha dam in the late 1970s. The dam brings water to Costa Rica's Pacific slope, where it is used by a hydroelectric power facility with a total output of 362 megawatts, equivalent to 33 percent of the total national generating capacity (and up to 50 percent during the dry season).

[The Arenal watershed](#)

Despite the steep slopes and rough terrain, 60 percent of the lower 8 900 ha Chiquito River microwatershed has been deforested and converted to pasture for cattle. The typical panorama in the watershed today is one of large areas of pasture on the lower slopes and a patchy mosaic of forest and pasture on the upper.

The watershed management plan, first drawn up by officials of the Arenal Conservation Area in 1993 and officially approved by the government in 1997, called for conversion from pasture to forest, particularly for the Chiquito River microwatershed, while at the same time offering cattle ranchers opportunities for technological improvements.

[Typical landscape of pasture and forest in a mountainous watershed area of Costa Rica](#)

The watershed management plan is consonant with the conventional wisdom among environmentalists which holds that the cutting of tropical forest for livestock production leads to large and sustained increases in erosion and sediment flows, increasing flood risk, decreasing dry-season flows and even lowering precipitation. The conventional wisdom also holds that livestock production provides little benefit to the economy, particularly as erosion eats away at productive yields over time.

The case study

From 1994 to 1997, the Collaborative Research in the Economics of Environment and Development (CREED) programme of the International Institute for Environment and Development (IIED) undertook a detailed biophysical, economic and institutional study of the Lake Arenal watershed, with particular emphasis on the Chiquito River microwatershed, to identify incentives and institutional arrangements for watershed management (Aylward *et al.*, 1998).

Biophysical and economic analysis. The biophysical and economic analyses (summarized in Table 1) had surprising results:

- Cattle ranchers were using the land productively; moreover, the positive externalities of livestock production significantly outweighed the negative externalities associated with variation in carbon storage capacity, even given a fairly generous value for stored carbon.
- Pasture benefited hydroelectric power production more than full forest cover did; pasture in the lower watershed resulted in lower evapotranspiration, and the cloud forest in the upper watershed, with its mosaic of pasture and forest, captured more horizontal precipitation (fog drip).
- The value of the increased water yield associated with livestock production significantly outweighed the concomitant increase in sediment flows.

Although, on the micro scale, there are areas where it would be better to reestablish forest and other areas that would be better off under pasture or some other solution, the general conclusion is plain: the presumption that forest should be re-established on pasture is invalid; on the contrary, the trend of forest conversion to pasture is actually justified.

TABLE 1. Evaluation of cattle production in the Chiquito River area

Product	Scale	Returns to cattle producers	Positive hydrological externalities	Benefits of forest production ^a
		<i>(net current value in US\$/ha)</i>		
Beef	< 80 ha	(581)	502-1 307	(554)-1
	> 80 ha	1 055	1 013-1 190	(554)-22
Dual-purpose	Large, mechanized, sales to national dairy cooperative	1 877	1 190	(554)-1
	Small, sales to major local cheese producer	612	222-720	(554)-16
	Sales to small cheese producers	38	1 135-1 190	(554)-1
Dairy	Large, mechanized, sales to national dairy cooperative	7413	292-1 190	(429)-15

Small, sales to major local cheese producer	271	1 442	(429)-16
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^a Negative returns for forest production refer to forest plantations, whereas positive returns reflect simulated returns from natural regeneration. It is also estimated that full watershed protection would cost US\$160/ha at net current prices, whereas the benefits of carbon storage from secondary regeneration in pasture would represent a net current value of some US\$200-300/ha, even given fairly generous prices for stored carbon.

Note: The figures for cattle production and hydrological externalities represent economic returns. Those for forest production represent net benefits for producers less existing incentives.

Source: Aylward *et al.* (1998).

Institutional analysis. In line with the approach of Ostrom and colleagues, the analysis of prevailing institutional scenarios in the management of the Arenal watershed and proposals for new management schemes took as its point of departure the distinction between the public and private natures of the bundle of goods and services produced in the watershed (Comes and Sandler, 1986). The goods and services were classified according to whether they were on-site values or externalities (off-site values):

- on-site values - dairy or beef production, extractive use of biodiversity, soil productivity;
- upstream externalities - sediment delivery, water production, flow regulation;
- downstream externalities - sedimentation, annual flows, flood control;
- other services and environmental attributes - biodiversity prospecting, carbon storage, the value of the existence of forests and of biodiversity.

[Local value-added forestry is one of the policy avenues being followed in Costa Rica](#)

Table 2 shows the general results of the classification of these goods and services by degree of exclusion and rivalry.

The fact that the classification and value of the goods and services in this table are site-specific complicates any generalization of the results of the analysis. (For more details on the classification, see Aylward *et al.*, 1998; Aylward and Fernández-González, 1998.) Additionally, these are "jointly" produced goods and services (Comes and Sandler, 1986). This variability would normally weaken centralized institutional arrangements for public sector production and provision of the goods and services.

An emerging trend towards a similar mix of institutional arrangements and incentives is clearly apparent.

Existing institutional schemes for watershed management

The extractive on-site uses of the watershed (livestock production, extractive uses of biodiversity) exhibit a high degree of exclusion and rivalry and thus a markedly private character. The current trend in the area is a shift from a simple to a differentiated market, with groups of users providing goods and services instrumental in livestock production and forestry (including equipment and supplies, processing and technical assistance). Some goods and services come from the central government (including the Ministry of Agriculture) and others

from the private sector.

That said, it is important to take a look at the "common" or public nature of the remaining goods and services analysed in Table 2. This is consistent with the nature of the existing forest protection schemes in the Chiquito River microwatershed and its environs, which have as their objective the improved organization of these goods and services. The general scheme is one of centralized supply and decentralized production of goods and services for watershed management.

The institutional situation in the Chiquito River area is generally mixed-part private, part public. It exhibits a local tendency towards polycentrism analogous to that at the national level, seen most clearly in recent experiences of interinstitutional coordination in the area. Increasingly formalized mechanisms for joint action on watershed management include local and regional environmental commissions established by the Arenal Conservation Area, the Tilarán Inter-Agency Commission, and the Arenal Watershed Management Commission, set up in 1997.

The main weakness of this emerging polycentrism is the deficiency or lack of a legal framework to bolster the jurisdiction of the various participating public agencies and to regulate cooperation, competition and conflict resolution among these units of government, their "public", their "political community" and the other public and private stakeholders that provide the relevant public or quasi-public goods and services (Ostrom, Tiebout and Warren, 1961).

TABLE 2. Exclusion and rivalry with respect to watershed goods and services in the Chiquito River area

Exclusion	Rivalry	
	Nun-rival (low)	Rival (high)
Non-excludable (low)	Public goods and services Sediment delivery Water yield Flow regulation Flood risk reduction Biodiversity prospecting β Existence value	Common-access goods and services Û Sedimentation Carbon storage β
Excludable (high)	Toll goods and services	Private goods and services Û Soil productivity On-site extractive uses Annual flows Dry-season base flow

Prospects for polycentrism in the context of policy options for better management

The CREED project sparked a participatory study-action approach, which culminated in the design of an Action Programme for the Chiquito River in 1996 and the establishment of a Bridging Commission responsible for implementing it. The commission included representatives of the Arenal Conservation Area, a local ranchers' association, a local coffee growers' cooperative, the national electric company and the municipality.

The main objectives of the Action Programme for the Chiquito River were:

- forest conservation and regeneration;
- conversion to forest in marginal pasture areas;
- improved livestock production;
- community development;

- development of local ecotourism projects;
- interinstitutional coordination for the administration of resources and incentives.

However, the economic and biophysical results of the CREED study, shown above and in Table 1, raised the question of whether - and how - forest conservation and regeneration, or reforestation, are always public "goods", or whether they might not instead give rise to considerable negative externalities. The results argued in favour of weighing the hydrological benefits of pasture over forest in specific sites in the microwatershed. These results induced the authors of the study to propose eight specific measures for relevant rectification of the Action Programme, bearing in mind the distinction between cloud forest and non-cloud forest zones in the watershed.

As had the Action Programme, the authors recommended reconversion of pasture to forest in erosion-prone areas and natural regeneration of buffer strips along streams.

In addition, however, for areas with cloud forest they recommended cutting and/or conversion of patches within large contiguous blocks of existing forest, windbreaks in pasture areas and natural regeneration of forest in extensive areas of pasture. Last, the authors suggested cutting and/or conversion of forest in non-cloud forest areas not prone to erosion.

The question of the polycentric political system needed to administer the costs or benefits of the principal externalities of livestock production (increased water yield, diminished carbon storage and increased sedimentation) can be approached through two questions:

- Who captures these costs or benefits? That is, who are the "publics"?
- How can these "publics" be transformed into the "political community" necessary for a self-governing, polycentric system with respect to the public or quasi-public goods and services under consideration?

The second question leads right into the issue of institutional arrangements and the specific incentives needed for the administration of the goods and services.

With regard to the first question, three "publics" or stakeholders were identified: livestock producers, the landholders in the watershed; the national electric company, which at least in theory represents the interests of the country's consumers of hydroelectricity; and eventual users of carbon.

Table 3 presents the CREED study's findings on the effectiveness of the proposed measures in involving the three stakeholders in the administration of these externalities. The table indicates whether implementation of the measures is compatible with private-sector type incentives or whether some institutional arrangement is needed to guarantee joint administration of the watershed's "bundle" of goods and services by all three stakeholders.

The analysis suggests that the involvement of the three groups varies according to the measure, as indicated in column four, which shows the extent of cooperation among stakeholders. It can be inferred from the table that the producers, acting alone or in conjunction with the electric company, could do substantially better than they do in the current situation. The incorporation of international stakeholders interested in carbon storage would produce additional gains.

The remaining question concerns the necessary mechanisms for empowering the stakeholders to administer the proposed measures correctly. Here the CREED study recommends setting up a two-way sealed-bid auction system of allocating contractual arrangements, under which producers agree to promote management improvements in exchange for compensatory resource transfers.

TABLE 3. Degree to which watershed management measures are sufficient to motivate stakeholder involvement and efficiency

Measure	Producers	Carbon stakeholders	National electric company	All three
Non-cloud forest areas				
Cut/convert forest	Sufficient (high)	Important to cut	Required (low)	Not important
Reforest erosion-prone areas	Sufficient (low)	Important (high)	Not important	Not necessary
Regenerate buffer strips	Not sufficient	Important (all)	Important (all)	Important (all)
Cloud forest areas				
Cut/convert forest	Sufficient (high)	Not important	Important (low)	Not necessary
Plant windbreaks	Sufficient (low)	Not important	Required (high)	Not necessary
Regenerate forest patches ^a	Not sufficient	Not important	Required (low)	Not necessary
Reforest erosion-prone areas	Sufficient (low)	Useful (high)	Required (high)	Useful (high)
Regenerate buffer strips	Not sufficient	Useful (all)	Required (all)	Useful (all)

^a In this case, it is assumed that holdings with high levels of profitability would only be interested in planting windbreaks.

Note: The indications "high", "low" or "all" in brackets suggest the relevant group of producers in terms of the degree of livestock profitability.

Although the necessary legal underpinnings for the institutional arrangement outlined here go beyond the bounds of the CREED study and this article, it is pertinent to point out the implicit need to review the potential for coordinating international, national and local legislation at the levels of operational and collective action, and perhaps even in the constitutional context (Kiser and Ostrom, 1982; Ostrom, Gardner and Walker, 1994). This would be a complex endeavour, of course, but it is highly important for achieving efficient, equitable and sustainable self-governing systems, not just in watershed management but in other vital aspects of society.

CONCLUSIONS

The case study on watershed management in Costa Rica demonstrates the applicability of the polycentric approach to the analytical and normative domains, which leads to the final - and still unanswered - question of existing potential within Costa Rica for self-government in watershed management.

The pluralistic focus is enriched with an express approach to the ethical and political foundations of polycentrism. The philosophical substratum of the *Unasyiva* issue on pluralism, calling for empowerment, autonomy, separation of powers and a system of checks and balances, remains perfectly explicit in the polycentric approach of Ostrom and his colleagues.

In shifting from a reactive to a proactive stance, the necessary incentives to "create and foster appropriate legal, regulatory and economic relationships between local communities, formal governmental institutions and, in some instances, commercial enterprises" (Lynch, 1998) are

clearly of capital importance. The interest in strengthening local institutional capacity highlights the strategic importance of the constitutional level for the establishment of a polycentric political system. From the vantage point of Ostrom and colleagues, this is the key to recognition of the jurisdictional and fiscal powers of the local bodies involved in the governing process.

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