

Fisheries Co-management in the Lower Amazon: an evaluation of the Voluntary Monitoring System

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Abstract

During the last 5 years the Brazilian government environmental agency Ibama implemented a co-management system in which communities of the Amazon floodplain have developed management systems to monitor and enforce fishing agreements. The objective of this research is to evaluate the monitoring system for community management, and to compare the costs incurred by participating communities and the federal government. The research involved interviews with 41 Volunteer Environmental Agents (VEAs) trained by IBAMA (out of a total of 144) from 32 communities to examine the management and enforcement activities of the VEAs. Included in the research was an examination of the monitoring systems used by participating communities, the number of patrols taken by VEAs per year, the people involved in each surveillance trip, and the costs of labor, food and materials. IBAMA agents were interviewed to estimate the costs of training and the costs of patrols carried out by the federal agency. Results showed that communities organized on average 3 meetings per year to discuss participation in the voluntary system. Communities also carried out 32 patrols per year consisting of 6 members and lasting approximately 13 hours each. IBAMA undertook 20 8 day trips to visit 32 communities. The VEAs evaluated the monitoring system as successful. They reported only two conflicts per community per year. Monitoring costs for the community included food, gas and opportunity costs of labour, amounting to R\$221000/yr for all communities. IBAMA had a total cost of R\$120.000. Communities dedicate 326 person days per year to monitoring lake fisheries. The federal government dedicates 5 days per community to monitoring activities. In addition to the lack of financial support by the government, 58% of VEAs also report a lack of support by community members as a key problem of the volunteer system and 25% of VEAs report a lack of support by IBAMA. VEAs further report a reduction in community participation in the volunteer system by 25% in the last five years. The lack of participation by community members shows that there is little incentive for community members to participate in the system. Payment of community labour by the federal government might reduce the risk of failure. The system would still be inexpensive compared to the cost to IBAMA's under the traditional model. For example, if the total community investment were undertaken by the federal government the costs of monitoring the lakes would be R\$1,992,895. This figure is 21 times larger than the present estimated cost of community labour (R\$ 95,454.55). If the federal government would pay the cost of labour to the community (R\$11/day of work), the system could become sustainable. With the reduction in volunteer participation in the monitoring system, only financial support by the federal government will sustain the monitoring system that is essential to the viability of the community management system.

I - Introduction

Over the last few decades, there has been a major shift in the management of natural resources throughout the world from the scientific management model, which prevailed through most of the 20th century, to more participatory approaches in which user groups and government managers share responsibility for developing, implementing and enforcing management agreements (McGoodwin 1990; Sen & Nielsen 1996). Proponents of participatory management or co-management approaches argue that they resolve a number of problems that had led to a crisis of confidence in the scientific management model, including more refined knowledge of local conditions, reduction in conflicts and incentives to work with rather than against management regulations (Pinkerton 1989). As co-management systems have been implemented throughout the world, there has been considerable research on the performance of these systems and on the identification of the factors that contribute to their success or failure.

Study of these experiences is revealing a number of issues related to the costs of participation and the logistical and motivational complications of involving resource users in the management process. Another major factor is the degree and quality of government participation in the new co-management system. From the perspective of resource users, the core problem revolves around the high transaction costs of participatory management systems: relatively high demands on the individual's time and even personal resources, conflicts resulting from monitoring and enforcement activities, and often limited cooperation from government officials. These problems exacerbate uncertainty regarding free-riding and reduce expectations regarding the likelihood of present and future benefits.

Management of Amazonian fisheries, like those elsewhere, is undergoing a transition towards a co-management approach. One of the major Amazonian experiments in fisheries co-management is underway in the municipality of Santarem in the Lower Amazon region of Pará, Brazil. Over the last decade a regional co-management system has been created consisting of 8 regional fisheries councils, covering all the major floodplain lake systems and representing some 170 communities and around 40,000 people. Each Regional Lake system has a legal fishing agreement specifying rules of access and use of the resource and Volunteer Environmental Agents (VEA's) have been trained to organize community participation in monitoring and enforcement activities. Construction of this co-management system was largely concluded by 2001-2002, so it has been possible to monitor implementation and evaluate performance over the last few years (Almeida 2004; McGrath et al. 2004; Isaac 2002; Inhetvin 2004). From the perspective of the resource, it appears that these agreements can be effective, despite the doubts of critics (Goulding et al 1996; Smith 1999). Almeida (2004) in a comparison of fishing productivity in managed and unmanaged lakes found that despite little difference in fishing practices the productivity of fishing effort was 40-60% higher in communities with functioning management agreements.

While performance from a resource perspective seems to be quite positive thus far, the actual functioning of the system has been more problematic (McGrath et al. 2004). Inhetvin (2004) undertook a study of the costs of the participatory and their distribution between communities (users) and the government agency, Ibama. He concluded that communities have borne a disproportionate share of the costs of the co-management

system. Related issues involve institutional design and performance. McGrath et al. (2004) identify a combination of problems in structure and operation that have hampered performance and that raise questions about the institutional sustainability of the co-management system in the medium to longterm. These problems are exacerbated by the relatively high costs of the co-management system, the large proportion of these costs that is born by floodplain communities and their leaders and the lack of mechanisms for compensating participants for all or part of their effort. In this paper we undertake a study of the costs of the monitoring system for community fisheries and explore institutional mechanisms for the long term financing of the co-management system.

II. Methods

For this study forty-one of a total 144 Voluntary Environmental Agents (VEA) from thirty-two communities in the lower Amazon were interviewed. The study area included the seven regional lake systems of the floodplain in the municipality of Santarém: Aritapera, Arapixuna, Lago Grande da Curuai, Urucurituba, Maicá, Ituqui e Tapará, covering a total area of 2,294 km² (Figure 1). Sample communities had an average of 71 families and 2 VEAs (Table 1).

Table 1. Number of registered VEA, Total VEA interviewed, Number of communities, Average number of families in a community, Average number of agents in a community.

Sample	
Number of registered VEA	144
Total VEA interviewed	41
Number of communities	32
Average number of families in a community	71
Average number of agents in a community	2

Interviews were undertaken to collect information regarding the age, education, and training of the VEAs, economic activities of VEAs, characteristics of community fishing agreements, and the nature and costs of community monitoring systems. Interviews were also conducted with the staff of the federal environmental agency, Ibama, to evaluate the cost to Ibama of training VEA's.

Figure 1. Map of the Lower Amazon region.

III. Results

1. Characteristics of VEAs: The average VEA is a forty year old married male, with 5 children, and six years of formal education. All VEAs live in floodplain communities. Their main economic activities are fishing (70%) and agriculture (15%) with another 15% engaging in both activities (Table 2).

Table 2. Characteristics of the VEA, Lower Amazon.

Profile of VEA	
Age	40
Years of school	6
Number of children	5
Main activities of VEA	%
Fishing	70%
Agriculture	15%
Fishing and Agriculture	15%

Presently, all the co-management agreements in the study area have been legalized by Ibama, the majority between 2001 and 2005. An agreement involves an average of seven lakes in each region. Communities hold an average of eight meetings a year to develop and refine fishing agreements (Table 3).

Table 3. Number of lakes regulated per agreement, number of meetings per year, and legalization of fishing agreements in the lower Amazon.

Fishing agreement	
Number of meetings per year to regulate agreements in each community.	8
Number of lakes regulated in each agreement	7
Agreements legalized between 1995 and 2000	33%
Agreements legalized between 2001 and 2005	68%

VEA's believe that fishing agreements have had a positive impact on the productivity of floodplain lake fisheries. Fifty-nine percent of the VEAs interviewed affirm that there has been a slight increase in productivity and thirty-seven percent think that the increase is quite large. Few VEAs think there has been a reduction in the number of boats entering lakes as a result of fishing agreements.

The VEAs also have a positive evaluation of the level of compliance on the part of community residents with the fishing agreement and believe that the great majority comply with most if not all of the rules contained in the fishing agreements. The most important measure identified by VEA's is the prohibition of fishing during the spawning period (December-March), followed by the minimum size requirements for some species (30%), and the prohibition on the use beach seines in lake fisheries (Table 4).

Table 4. Evaluation of agreements by VEAs.

Evaluation of fishing agreements in the community	
Positive impact	100%
Impact of the agreement	
Slight increase in the quantity of fish	59%
Large Increase in the quantity of fish	37%
Reduced the number of boats entering the lakes	2%
Improved the quality of the fish	2%
Percentage of people that comply with agreement in community	
From 80% and 100%	50%
Between 50% and 70%	25%
From 10% to 40%	25%
Most important rules	
Ban of fishing activities during spawning period	42%
Limits on size of fish	30%
Ban on use of drag nets	12%
Prohibition on seasonal use of gillnets	7%
All rules are important	3%
Prohibit fishing in one chosen lake	3%
Prohibition of gillnet during the low water period.	3%

2. Characteristics of the monitoring system in the community

One of the main functions of the VEA is to organize patrols to monitor fishing in community lakes. VEAs meet with community representatives an average of four times a month to discuss plans for patrolling the lake. An average patrol involves 13 people in 2 teams of approximately 6 people each. Many communities have fixed volunteer crews (40%) for patrolling lakes, but most of VEAs must recruit volunteers for each trip. Patrols last an average of 13 hours, and communities conduct a total of 32 patrols per year. IBAMA participates in one patrol per year with each community. In most trips IBAMA contributes may contribute food and/or transportation and educational materials. VEAs seek to involve the community in the monitoring system in several ways. About half of the sample recruit teams for patrols during community meetings organized for this purpose. Another 23% of VEAs state that community residents participate only when there is a known infraction, Another 26% of VEAs report that they work with fixed crews or involve community leadership in organizing patrols (Table 5).

Table 5. Characteristics of the monitoring system in the lower Amazon.

Community monitoring system	
Number of monitoring trips per month	6
Duration of monitoring trips (hours per day)	13
Number of times Ibama participates in the community trips (per year)	1
Contribution of IBAMA with the costs of monitoring trips	
Transportation and food	47%
Transportation	37%

Food, transportation, and didactic material	16%
Description of the monitoring system	
VEA works with residents volunteers	45%
VEA acts as demanded by the community	23%
VEA establishes permanent local voluntary crew and a plan of work	18%
VEA acts in collaboration with other leaders in the community	8%
VEA works with fisheries councils in larger regions	6%

In most cases patrols are carried out in paddle canoes (58%), open boats with diesel engines, known as “bajara”, (24%), outboards (16 %) and motorized canoes (2%). Equipment consists of flashlights (83%), cameras (34%), lifejackets (ten percent), celphones (10%), and rain coats (7%) (Table 6).

Table 6. Type of boat and equipments taken in the monitoring trip.

Vessel		Equipment	
Canoe	58%	Flashlight	83%
Open boat	24%	Camera	34%
Fast boat	16%	Lifesaver	10%
Motorized canoe	2%	Mobile telephone	10%
		Rain coat	7%

In 2004 VEA’s made an average of 3 citations per community involving seizure of fishing and fish. In most cases the seized gear was handed over to Ibama (71%).. Fish apprehended during patrols was donated to the community in 90% of the cases (Table 7).

Table 7. Fishing gear and fish seized in 2004 by VEA, Lower Amazon.

Fish and gear seized in 2004	
Citations in 2004 per community	3
Number of times fishing gear was seized	1
Number of times fish was seized	2
Disposal of seized gear	
Given to Ibama	71%
Returned to owner	17%
Destroyed	8%
Given to public ministry	4%
Disposal of seized fish	
Donated to the community	90%
Given to Ibama	10%
Type of infraction in 2004	
Breaking rules fishing agreement in 2004	79%
By Fishers from outside the community	74%
By fishers from the community	26%
Trends in conflicts in 2004	

Number of conflicts per community	2
Reduction in reported conflicts	89%
Increase in reported conflicts	8%
Number of conflicts unchanged	3%

VEAs report only 2 conflicts per community per year. Those responsible are from outside the community in 74% of the incidents, with community members accounting for the other 26%. Most VEAs (89%) believe that the number of conflicts decreased after the VEA system was established. (Table 7).

3. Evaluation of the community system by the VEA.

Most of the VEAs (61%) rate the monitoring system as good, although a significant minority consider it only adequate 39%. A bare majority (51%) believe that communities provide good support to the agents, while the other 49% consider community support to be only adequate. The majority (84%) of the agents think that the monitoring system has been much improved with the creation of VEAs. Views on community participation are mixed, and 43% of those interviewed think that more people are participating, 32% that participation has not changed and 25% that participation has declined. A significant majority stated that more support from the community is necessary to improve the monitoring system and 25% that more support from Ibama is needed. (table 9).

Table 9. Evaluation and involvement of community participation.

Community Support for VEA's:	
Good	51%
Adequate	49%
Monitoring System is:	
Good	61%
Adequate	39%
Community enforcement:	
Improved with creation of VEAs	84%
Is unchanged	8%
Is worse	8%
Most members participate	43%
No change in participation	32%
Participation reduced	25%
What must be done to improve the monitoring system	
More support from the community	57%
More support from government authorities	25%
Improved transport and equipment	13%
Financial compensation for VEA time spent in patrols	5%

4. Community monitoring costs

The monitoring system generates costs for the government and the community. With the creation of the VEA, Ibama took responsibility for training and monitoring of the agents. Interviews with government staff were conducted to evaluate the Ibama's costs with the co-management system. Costs were estimated separately for mobilizing participation in developing fishing agreements, for capacity building, and for patrols.

To involve the communities in developing fishing agreements Ibama organizes about 30 meetings per year with about 40 communities participating in each meeting. The annual costs to the government for the public mobilization required to develop a fishing agreement is around R\$21,000. The government also invested another R\$17,200 per year in recruiting the VEAs. On average the government organizes 5 meetings per year in each of 7 different regions, with the participation of 50 people and 3 Ibama agents at each meeting. In addition, 30 VEAs participate in two courses per year at a total cost of R\$13,000.

After training the VEAs, Ibama monitored their performance, conducting an average of 4 meetings per year with the participation of 144 agents and 2 Ibama agents (Table 10).

Table 10. Government costs for training and monitoring of VEAs, Lower Amazon.

	Number of meetings per year	of Total cost per (food transportation)	and Total (Labor)	cost Total
Mobilization for fish agreements recruitment of AAV	30	11.100,00	9.886,36	20.986,36
Training of VEAs	5	12.250,00	4.943,18	17.193,18
Monitoring of VEAs	2	7.800,00	4.943,18	12.743,18
Total Annual Cost	4	5.760,00	2.636,36	8.396,36
		36.910,00	22.409,06	59.319,08

On average the VEAs conduct 32 13 hour patrols per year involving an average of 6 people.

Total food and transportation costs covered by the community are R\$96,075 per year. Labor costs average R\$124,982 (estimated using the opportunity cost of labor in the community (R\$11 per day)). The total annual cost of the monitoring system for the average community is R\$221,057 (Table 11).

Table 11. Total annual costs of monitoring in the community.

Custos da Comunidade	Média
Number of trips per year	32
Number of communities	32
Number of people per trip	6
Hours spent monitoring	13
Daily payment in the community (R\$)	11,98

Food and transportation per year (R\$)	96.075,08
Labor cost per year (R\$1)	124.981,51
Total Annual Cost of Enforcement (R\$1)	221.056,60

Each community conducts 32 trips per year, so more than two thousand trips per year are conducted by the 71 communities with VEA's. In contrast, Ibama conducts only 20 monitoring trips per year of 7,5 days each in which 5 communities are visited each day. On average, 3,5 Ibama employees participate in these trips. Using the average daily allowance of a government employee (R\$330), the average cost of labor for Ibama is estimated at R\$173,011. Including the cost of food and transportation (R\$25,000), the total cost to Ibama of monitoring agreements is R\$198,411 per year (Table 12).

Table 12. Costs of government monitoring agreements

Monitoring Costs for Ibama	
Number of patrols per year	20
Duration of trips	7,5
N° of communities visited each day	5
N° Ibama agents participating	3,5
Food & Transport per year(R\$)	25.400,00
Labor costs per year (R\$)	173.011,36
Total annual Cost of Patrols (R\$)	198.411,36

5. Improving the monitoring system

The great majority of VEAs (82%) consider the quality of monitoring carried out by Ibama to be barely adequate **regular**. They suggest that Ibama agents should participate more in monitoring agreements. (Table 13).

Table 13. Suggestions for improving government monitoring.

VEA Suggestions for improving enforcement by IBAMA	
Greater participation of Ibama agents in communitiess	91%
More Ibama agents to assist in enforcement	3%
Lack of enforcement at strategic points during the spawning season	3%
Ibama should pay VEAs	3%
VEA Evaluation of Ibama participation in monitoring	
Adequate	92%
Good	8%
Enforcement by Ibama today compared with the past	
The same	38%
Worse	33%
Better	28%

IV - Conclusion

The voluntary monitoring system is considered to be effective in that data indicate a reduction in fisheries conflicts in participating communities. The efficacy of the system, though, depends on the interest of community members in participating actively in the enforcement of the fishing agreement. The great majority of VEAs believe that the enforcement system improved considerably with the creation of VEAs, however, community participation has not accompanied these changes. More than half of VEAs believe that community support for enforcement has either diminished or stayed the same. In relation to enforcement costs, while communities have an estimated annual cost of R\$221,000 each, Ibama spends an average of R\$198,000 per year on enforcement. The lack of human resources is considered by VEAs to be one of the main problems hampering government participation in enforcement. The lack of participation by community members weakens the position of VEAs and makes the system less efficient. Payment of community labor to participate in enforcement activities would contribute to the long term institutional sustainability of the co-management system.

V - References

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