

**Effectiveness of Communication and Regulation in Local  
Commons:  
Some Evidence from Experiments in the Field**

Juan Camilo Cardenas, Graduate Assistant  
Department of Resource Economics  
University of Massachusetts-Amherst

John Stranlund, Assistant Professor  
Department of Resource Economics  
University of Massachusetts-Amherst

Cleve Willis, Professor  
Department of Resource Economics  
University of Massachusetts-Amherst

Please send correspondences to: ~~Professor~~ ~~Cleve Willis~~, Department of Resource Economics, 230  
Draper Hall, University of Massachusetts-Amherst, Amherst, MA 01002

## **Effectiveness of Communication and Regulation in Local Commons: Some Evidence from Experiments in the Field**

**Abstract:** Agents are apt to over-exploit common-pool resources. Two devices for nudging individuals toward efficient use of a local common are government imposition and enforcement of rules and simple communication. Experiments were conducted in areas of rural Colombia to study the effects of these two devices on the behavior of individuals who are actually involved in a local commons. Communication among subjects improved efficiency. A more dramatic increase in efficiency obtained when a government regulation was introduced, but that efficiency degraded to no-communication levels after only a few rounds of experience.

**Keywords:** *Common-Pool Resources, Experimental Economics*

The problems with common-pool resources (CPR) are well known. Left to their own devices, agents are apt to over-exploit these resources to society's detriment. In a game theoretic context, the Nash equilibrium offers a particular level toward which this over-exploitation should tend. To date, however, the results from experimental economics indicate that in the laboratory at least, agents faced with CPR decisions do not typically reach Nash levels of exploitation; nor do they achieve efficient outcomes (Ostrom [1997, p.7])- The same general result characterizes the laboratory evidence on privately provided public goods (Ledyard [1995]). As Harper [1989, p.96] put it in this *Journal*, these stylized agents in theory "...are seen to be Flatlanders at best, lacking in the most essential dimensions of humanity. Real people care about other people, make trade-offs between many types of goods and nonmarket experiences, endeavor to think well of

themselves in spite of all the evidence to the contrary, engage in self-deception, make logical errors, and find many types of choices difficult or unpleasant."

Two mechanisms for nudging agents toward a socially optimal use of common-pool resources—moving them along the spectrum further from the Nash equilibrium toward an efficient outcome—are simple communication and government enforcement of rules and sanctions. Because research in actual CPR settings involves such a diversity of physical, social, and economic settings, it is difficult to understand which of a multitude of variables may explain differences in behavior. And this is why, as Ostrom and Walker [1997, p.4] argue, laboratory experimental economics in which one can change a single variable at a time can be so valuable. A substantial number of laboratory experiments have been conducted which show that in a laboratory setting, communication among agents sharing a CPR can be effective in bringing about a movement toward a choice of a joint-maximizing strategy, even when these cooperative choices conflict with individual incentives (Ostrom, Gardner, and Walker [1994, p. 149]).

It remains, despite the great advantages laboratory experiments offer in this regard, that the subjects of laboratory experiments may think or behave somewhat differently from individuals caught in an actual common-pool resource dilemma in the field. The motivation for this research, then, was to combine the best of the laboratory with the on-site field setting—to bring the laboratory to the field, where the experimental economics subjects are the users of a CPR. In the summer of 1998, we "took the laboratory" to three villages in Columbia, South America, to learn how communication and regulation might affect local indigenous choices on rates of exploitation of common-pool forest resources. We found that communication alone had a positive effect on choices, moving the "community" in the direction of the efficient outcome. With a regulatory rule

that sought to limit choices to efficient levels but with a relatively weak monitoring and sanction protocol, we found a rather more profound initial move toward the socially optimal outcome. But regulatory compliance for these groups degraded over time so that after several rounds, the groups that were communicating, but with no external agent to enforce cooperation, were achieving greater conservation and societal benefits than those that were "regulated".

### Communication and Regulation in CPR Research

There are two views about the ability of communication to encourage cooperative choices in the face of conflicting individual incentives. One is that "talk is cheap" and in resolving problems such as posed by CPR problems, in the absence of external enforcement of agreements, communication is of no value. This view dates back to Hobbes [1651] and underlies noncooperative game theory. Some theorists argue that the ability to communicate or not is irrelevant in the absence of enforcers-cheap talk is not a basis for moving from a Nash equilibrium to a more efficient choices (Farrell and Rabin [1996]). In finitely repeated games, they establish that enforcement is necessary for cooperation. And while many theorists would hold that for infinitely repeated games efficient solutions can be found without an external enforcer, this first view argues that we live in a finite- period world.

But the evidence from the laboratory to date suggests the opposite. In these finite experiments, communication, even without external enforcement, has been shown to produce gains in efficiency. Ostrom, Gardner, and Walker [1994, p. 148] suggest that this result may stem partly from incomplete information. For example, in experimental economics applications, great pains are taken to be certain the subjects do not know how many rounds will be played. While

*no - that did not tell them  
In Public goods - end point was taken - not*

they obviously know the number of rounds must be ~~finite~~, they do not know when a particular round is the final one. Ostrom also notes that the evidence of improved efficiency emanating from communication is greater where the communication is face-to-face than when it is achieved by exchanges using computer terminals. Human reactions, including the development of group identity, are candidate reasons for the disparity of experimental findings and theoretical results.

Less is known about the effects of regulation on behavior, although some experimental results have been obtained on group-initiated monitoring and enforcement of regulations. For example, Moir [1997] extended the earlier work of Ostrom, Gardner and Walker [1994] to address the issue of monitoring and sanctioning in common-pool resources. Within the same common-pool model, he compares the baseline where no communication is allowed with two alternatives. In one, group members may monitor the behavior of the others, and in the other, members can sanction the non-optimal behavior of their colleagues. The main results were that monitoring alone may not help correct the coordination failure by reducing the aggregate level of extraction from the common-pool, but sanctions involving the actual enforcement of rules may be relatively effective in limiting extraction levels and improving efficiency. Likewise, Baland and Platteau [1997] develop a theoretical case for regulating the commons, but indicate that incomplete information is a problem for effective enforcement. To our knowledge, however, CPR experimental economics research has not been undertaken to model the behavioral responses of groups to a governmentally imposed regulation with monitoring and sanctions.

### **The Colombian Setting**

The field experiments were undertaken during the summer of 1998 in three rural villages of Colombia. The locations were chosen so as to have a predominantly rural population with collective access to a local commons with key natural resources and a multiple set of direct, indirect and non-use benefits (e.g. firewood, water regulation and biodiversity preservation).

The first village, (NUQUI), surrounded by coastal mangroves and rich tropical rain forest, is located in the pacific coast. Due to its location between the coast, a river mouth, and the forest, households in this village make their living from sea and mangrove fishing, small fanning mainly for self-consumption, and small scale logging for firewood and wood use. A very small portion of income is derived from wage labor or marketing of products in this community. There is essentially no individual property in forested areas in this region, and access to resources including fish, land or forest products is essentially open for all villagers, although it is quite restricted for outsiders, even from neighboring villages and even including the use of their coastal fisheries.

The second case study, in the QUINDIO coffee region in the mid-Andes, was undertaken in two neighboring villages, Circasia and Filandia, which share the benefits of state and privately owned forested areas of Ajidean cloud forests. The subjects were drawn from a group of families whose income is related to the extraction and processing of natural fibers from these forests. Households in this village have an important portion of their income derived from wage labor, mainly during the coffee harvest seasons, and through cash earnings from marketing their products.

The third village, ENCINO, is located in the Eastern Andean region. In terms of ecological conditions, this village benefits from its proximity to the Virolin National Park and other forested

areas of Andean tropical cloud forests. Although the Virolin National Park is under state management, most of the population has access to park for extracting firewood, small scale logging, hunting and water. The primary source of income for the villagers of Encino is agriculture (sugar cane, coffee, plantain, maize, others) on small farms (around 3 ha.).

As indicated, therefore, the population from which the subjects for these experiments were drawn is of rural households that benefit from a neighboring local commons. Firewood is the main source of energy for these households, and they generally use water from these local commons. These households derive an important portion of their income and consumption from fishing, logging, harvesting fibers, and hunting in nearby commons. In each of the three villages, the participants generally knew each other well, having lived in the same village for most of their lives. Schooling, age and income levels varied significantly for the participants within each group. Most participants had fewer than 6 years of schooling, roughly half were between 30 and 50 years old, and all were 16 or older.

### **Experiment Design**

The experiments reported here are based on a simple model of a fixed number of individuals with unrestricted access to a local common-pool resource. The participants in the experiments were presented with a situation similar to those they actually face; namely, the decision to extract firewood from a local forest. In each round of the games, each participant was allocated an endowment of time that could be allocated to collecting firewood or to an alternative pursuit like providing labor to an unrelated market. Private and social interests diverge in our design because

we assume that collecting firewood generates a pure public bad. In particular, the extraction of firewood leads to increased soil erosion that, in turn, adversely impacts local water quality.

We report two treatments in this paper. For both treatments, each of 11 groups of 8 subjects played 8-11 rounds in which each subject chose how much time to spend collecting firewood from the local forest. In these initial rounds the subjects were not allowed to communicate with each other. After the initial rounds, 7 of the 11 groups played an additional 9-12 rounds in which the subjects were allowed to communicate with each other between rounds. The subjects in the other 4 groups faced an entirely different situation after the initial rounds of play. They were told that a government authority had imposed a uniform standard on the amount of time an individual could spend collecting firewood from the forest. In every round, a particular individual's choices would be audited with a fixed probability. If found to be in violation of the standard, a fixed per-unit penalty would be assessed for every unit of time the individual was in violation of the standard. Subjects in these 4 groups played 9-12 additional rounds under these conditions. The number of rounds in each sub-treatment were varied so that the participants would not know the terminal rounds even if they had heard stories about another group's experience.

### *Payoffs*

Individuals payoffs were generated from a simple model of CPR exploitation by a fixed number  $n$  of homogenous individuals. In each round of the games, each individual is given an endowment of time  $e$  that can be allocated to collecting firewood or to providing labor to an unrelated market. Let  $x_i$  denote the amount of time individual  $i$  spends collecting firewood from the common, and let

$w$  denote the prevailing wage for labor. Then,  $i$ 's decision to provide  $(e - x_i)$  units of labor to the formal sector yields a payoff of  $w \times (e - x_i)$ . Time spent collecting firewood from the forest yields a private benefit, which we assume takes the quadratic form  $g(x_i) = \gamma x_i - \phi(x_i)^2/2$ , where  $\gamma$  and  $\phi$  are strictly positive and are chosen in part to guarantee  $g(x_i) > 0$ , for  $x_i \in [1, e]$ . The strict concavity of  $g(x_i)$  indicates diminishing marginal private returns to time spent collecting firewood.

Extracting firewood adversely affects water quality in the area. Suppose that water quality  $q$  is a quadratic function of the aggregate amount of time individuals in the community spend collecting firewood. Assume that  $q(\sum x_j) = q^0 - \beta(\sum x_j)^2/2$ , where  $\beta > 0$ , and  $q^0$  is interpreted to be water quality in the absence of firewood extraction. Again these parameters are chosen in part to guarantee  $q(\sum x_j) > 0$  for all feasible  $\sum x_j$ . An individual's valuation of water quality is  $f(\sum x_j) = \alpha q(\sum x_j)$ , where  $\alpha$  is another positive constant.

Define  $u(x_i, \sum x_j)$  to be the sum of the sources of utility for an individual exploiter of the local forest. Parameters were chosen, in part, to guarantee that  $u(x_i, \sum x_j) > 0$  for all possible  $x_i$  and  $\sum x_j$ . To facilitate scaling individual payoffs, we take an individual's payoff function to be a positive, monotonic transformation  $F$  of  $u$ . In particular,  $F(u) = (\mu/\delta)(u)^\eta$ , where  $\mu$ ,  $\delta$ , and  $\eta$  are all positive constants. An individual's payoff function is then

$$\begin{aligned} U(x_i, \sum x_j) &= (\mu/\delta)[f(\sum x_j) + g(x_i) + w \times (e - x_i)]^\eta \\ &= (\mu/\delta)[\alpha(q^0 - \beta(\sum x_j)^2/2) + (\gamma x_i - \phi(x_i)^2/2) + w \times (e - x_i)]^\eta. \quad [1] \end{aligned}$$

Each group consisted of  $n = 8$  subjects, and each subject was allocated  $e = 8$  units of time in each round. Scale concerns led us to choose the following remaining parameter values:  $w = 30$ ;  $y =$

97.2;  $\phi = 3.2$ ;  $q^0 = 1372.8$ ;  $\beta = 1$ ;  $\alpha = 1$ ;  $\mu = 2$ ;  $\delta = 16,810$  and  $\eta = 2$ . Individual payoffs were therefore calculated from the payoff function

$$U(x_i, \sum x_i) = (2/16,810)[1372.8 - (\sum x_i)^2/2 + 97.2x_i - 3.2(x_i)^2/2 + 30(8 - x_i)]^2. \quad [2]$$

Subjects were given a table of payoffs as a function of individual choices and the choices of all other participants. The table is provided in the appendix. Pre-testing of the experimental designs at the Humboldt Institute for Biodiversity in Villa de Leyva, Colombia led us to denominate units of time as months per year.

#### *Efficient and Nash Equilibrium Choices*

Common reference points for individual choices in experiments of this type are those that maximize group welfare, and those that constitute a one-shot, complete-information Nash equilibrium.

Since the player's payoffs are identical, optimality requires symmetric individual choices. Let  $x$  denote the common amount of time each individual spends collecting firewood in any symmetric outcome. Using [1], the joint welfare function is

$$W(x) = n(\mu/\delta)[\alpha(q^0 - \beta(nx)^2/2) + (\gamma x - \phi(x)^2/2) + w \times (e - x)]^\eta.$$

The first-order condition for the maximization of  $W(x)$  is

$$n(\eta\mu/\delta)[u(x, nx)]^{n-1}[-\alpha\beta xn^2 + \gamma - \phi x - w] = 0,$$

which requires  $-\alpha\beta xn^2 + \gamma - \phi x - w = 0$ . Solving for  $x$  and substituting the actual parameter values yields optimal individual amounts of time spent harvesting firewood,

$$x^* = (\gamma - w)/(\phi + \alpha\beta n^2) = 1. \quad [3]$$

Thus, in our design the optimal amount of time each individual spends collecting firewood is 1 unit.

A Nash strategy by player  $i$  is the value of  $x_i$  that maximizes [1], taking  $\sum x_j - x_i$  as fixed.

Focusing on interior solutions, the first-order condition to determine  $i$ 's Nash strategy is

$$(\eta\mu/\delta)[u(x_i, \sum x_j)]^{n-1}[-\alpha\beta(\sum x_j) + \gamma - \phi x_i - w] = 0,$$

which is satisfied only if  $-\alpha\beta(\sum x_j) + \gamma - \phi x_i - w = 0$ . In a symmetric equilibrium,  $-\alpha\beta nx + \gamma - \phi x - w = 0$ . Solving this last equation for  $x$  and substituting the actual parameter values yields

$$x^N = (\gamma - w)/(\phi + \alpha\beta n) = 6 \quad [4]$$

as the symmetric Nash equilibrium for our design. At the Nash equilibrium, subjects earn about 24% of the payoffs attainable in the efficient outcome.

The Nash equilibrium changes when the subjects face a uniform quota on the amount of time that can legally be spent collecting firewood. Let the quota be  $s$ . An audit of an individual's activities occurs with probability  $\pi$ . If an individual is found to have spent  $x_i > s$  time collecting firewood in a particular period, it faces a penalty  $p$  on every unit of time in excess of  $s$ . Thus, an individual faces an expected penalty of  $\pi p(x_i - s)$ . Assuming risk-neutrality, the Nash strategy for an individual in this treatment maximizes  $U(x_i, \sum x_j) - \pi p(x_i - s)$ . The first-order condition is

$$(\eta\mu/\delta)[u(x_i, \sum x_j)]^{\eta-1}[-\alpha\beta(\sum x_j) + \gamma - \phi x_i - w] - \pi p = 0.$$

Even with the imposition of symmetry, solving for Nash equilibrium choices in this situation by analytic means is difficult. Fortunately, in specific contexts (i.e., specific parameter values), the equilibrium can be deduced easily from the payoff tables used by the subjects in our experiments.

Under the regulation-with-enforcement treatment, we chose the individual quota  $s$  to be the efficient choice; that is,  $s = 1$ . We chose the probability of an audit to be  $\pi = 1/16$ , and the unit penalty for exceeding  $s = 1$  to be  $p = 100$ . Subjects faced an expected marginal penalty for violating the standard of  $\pi p = 100/16 = 6.25$ . With the payoff table in the appendix it is easy to show that the symmetric Nash equilibrium under these circumstances, assuming risk-neutrality, is that each individual spends 5 units of time collecting firewood from the forest. Clearly, we could not control the risk-attitudes of the subjects. Predominant risk-aversion would imply lower Nash equilibrium individual choices, while risk-loving would imply equilibrium choices greater than 5.

It is worth noting that at the regulatory Nash equilibrium with risk-neutral subjects, an individual that is found to be in violation of the standard for a particular round would forfeit 400

points and, from the payoff table in the appendix, would experience a loss of 107 points for the round. However, since the audit probability is set low, the expected penalty for an individual in the Nash equilibrium is only  $400/16 = 25$  points, and hence, an individual's expected gain in the Nash equilibrium is 268 points. This value is about 41.55% of individual payoffs in the efficient outcome.

We chose a relatively weak enforcement strategy for two reasons. In all likelihood, weak enforcement better characterizes the state-imposed regulations our subjects actually encounter. In rural communities of developing countries like those where our experiments were conducted, monitoring of state and federal regulations is likely to be quite lax because of high costs and limited enforcement budgets. Clearly, with low audit probabilities, actual penalties need to be very high to induce acceptable levels of compliance. The other reason we chose a weak enforcement strategy is that if we were to use an expected penalty that would be predicted to induce full compliance to the time quota, actual penalties would be so high that we would run a high risk of bankrupting an individual caught in violation.

Even in industrialized countries, enforcement strategies for environmental and natural resource regulations appear to be rather weak in the sense that expected marginal penalties do not appear to be sufficient to ensure acceptable levels of compliance (Cohen [1998]). This is also appears to be true of other forms of regulation; for example, income tax compliance in the United States (Andreoni, Erard and Feinstein 1998)].

## **The Experiments**

Each session of the experiment involved 8 subjects and two monitors. The subjects sat at individual desks that were distributed in a circle with enough separation between the desks so they could not look at another's work. Except in periods when communication was allowed, the desks faced away from the center of the circle. In each round, each subject would choose how many **units of time,  $x_i \in [0, 8]$** , to spend collecting firewood from a local forest. Each subject was given the payoffs table in the appendix and they knew that the other participants consulted the same payoffs table. Thus, although an individual could not know in advance what the others would choose, he or she knew that their decisions were based on the same payoffs. Once a subject made a decision for a particular round, this decision was written on a slip of paper. Once all subjects had made their decisions a monitor collected each slip of paper and gave them to the other monitor who recorded the individual decisions and calculated the total for the group. This total was announced to the subjects who then determined their own payoffs from the payoffs table. Each subject kept a record of their payoffs as a check on the monitor's record.

Each session began with some welcoming remarks within which the subjects were told that the session would last approximately two hours. A monitor would then read the instructions to the participants. [The instructions are available from the authors]. Results from pre-tests of the experiment led us to decide to not give the subjects written instructions because of the wide variation in levels of literacy among the subjects. The instructions explained the basic setting of the game, how points were earned, how these points were converted to cash at the end of the session, and the procedures of the game. The instructions included three different examples to familiarize the subjects with the payoffs and the procedures. Two practice rounds were conducted. The monitor asked for questions at several points, and when there were no further

questions the game began with round 1. Large, readable posters of the payoff table, the forms the subjects used during the game, and the examples from the instructions were placed on one wall of the 'field lab'.

In total, 11 groups from three villages played two treatments of the game. Each of the 11 groups played 8-11 initial rounds of the game. During these initial rounds individuals made their choices without communicating with the others in their session or with the monitors. The subjects did not know how many rounds would be played. After the initial rounds the monitors would stop the game and announce a new set of rules for the forthcoming rounds. At the beginning of the session, the subjects were not told that the rules would change at some point in the session.

#### *Communication Treatment*

After the initial rounds, 7 groups were told that they could now communicate with each other between rounds for 3 minutes. Between rounds the subjects turned their desks toward each other. They could talk to each other about anything, but they could not threaten others or agree to transfers of cash at the end of the game. Once 3 minutes had passed, an alarm would sound and the subjects were required to turn their desks back around and make their individual choices in private. These groups played an additional 9-12 rounds in this way.

#### *Regulation Treatment*

The other 4 groups were not allowed to communicate after the initial rounds. Instead they faced a regulation that allowed them to spend no more than one unit of time collecting firewood from the forest in each round. They were told that one of them would be audited with probability

1/2 after all had made their choices in a particular round to verify compliance with the rule. After all had submitted their choices for the round and the aggregate amount of time spent in the common was announced, a die was rolled to determine whether an inspection would occur that period. An inspection would take place only if an even number came up. To determine which individual would be inspected, a number between 1 and 8 would be drawn from a hat and that person's choice would be audited. Note that the probability that any one player would be audited for a particular round was 1/16. Once a player was chosen to be audited, a monitor would walk to that person's desk and verify his or her choice. If the audited player was found to be in violation for that round, a penalty of 100 points per unit of time above the time quota would be subtracted from that player's payoff for that round. Although the other players knew that an audit was conducted and who was audited, they did not know whether a penalty was assessed, nor the extent of the penalty. These groups played an additional 9-12 rounds under these rules.

At the end of each session, total points for each individual were calculated. Subjects were paid that number in pesos for their participation. On average, each player could earn between one and two daily minimum wages. For the villages in which the experiments were conducted, a daily minimum wage centered around 7,000 pesos (about US \$5.40 at the time).

## **Results**

Figure 1 shows the average choices made by the participants per round. Panel (a) covers the initial rounds in which no communication was allowed. The experiment was the same for the groups that would later be given the chance to communicate as for the groups that would later be regulated, but we show the mean choices separately to maintain comparability with the right-side

portion. Both sets of experiments produced similar results in the absence of communication. Average effort per individual was around 4 or 5 units of time per period, with no obvious trend over the rounds. Even with no communication allowed, it is notable that the collection of 88 participants did not on average arrive at the Nash solution of 6 units of time per period; nor did they approach the efficient solution of 1 unit of time.

As indicated earlier, we ended the no-communication rounds as well as the second stages at different points to be sure the terminal round could not be anticipated. Some initial rounds ended after 8 and others went through 9, 10, or 11. We therefore truncate the left portion at 8 rounds so that we have all groups represented in these initial rounds. Panel (b) begins with the first round in which the rule was changed to allow communication for some or to impose the rule with possible penalty for the others. All groups went through 9 rounds in this mode, and some a few more for the reason earlier indicated.

First, notice that, for the 7 groups that were allowed to communicate, while the mean decisions fluctuate somewhat over the 9 rounds, these mean effort levels fluctuate within the 3 to 4 interval. Before communication, those effort choices were in the 4 to 5 interval. Clearly, for these groups, face-to-face communication, even though no one was allowed to see the choices of the other, improved the group outcome.

The regulation results are quite interesting. Recall that the monitoring and sanctions protocol for this treatment were chosen to be relatively weak to simulate many realities. One could cheat and have a low chance of being penalized in any particular round. And, while, if the player cheats at the maximum level, he or she may forfeit all gains and a bit more for the round, the penalty is not devastating. There are other rounds in which to earn rewards. Now, note that,

in the first round after the regulation was put into place, the average effort in the common dropped to 2 units of time, a level quite close to the social optimum. The efficient level was not reached-some participants did ignore the quota-but it was a rather dramatic change. But as the rounds proceeded and players became comfortable with the rule and the weak consequences of breaking the rule, and as they understood that others were also violating the regulation, they began to increase effort. By round 3, they were exploiting the common-pool resource at a higher average level than groups that communicated, but had no rule or sanction, and they continued to do so through the rest of the rounds. In the end, they were cutting the forest at levels about the same as they were before the rule. As indicated in the figure, the Nash equilibrium for the regulation experiment, assuming risk-neutrality, is 5 units of effort. Thus, while most individuals at first seemed compelled to obey the rule, after relatively brief experience they performed in the aggregate almost precisely as the Nash equilibrium would predict.

Regulation with modest enforcement appears to be completely ineffective, except in the short run. Ultimately, average individual choices roughly correspond to those in the no-communication and no-regulation setting. Even though average individual choices are similar after a few rounds, because of the penalty payments that are implicitly transferred to the regulatory authority, the participants as a whole are clearly worse off with the regulation, even though it was intended to improve their lot by essentially making free-riding behavior illegal. This unfortunate situation is even worse from a broader social point of view because the implicit resources invested in monitoring and punishment are ultimately wasted.

That average individual choices actually approach the Nash equilibrium in the regulation setting was unexpected. A simple extrapolation of average choices from the no-communication

setting to the regulation setting; that is, a prediction that average choices in the regulation setting would end up being between 67% and 83% of the Nash equilibrium choices as they are in the no-communication setting, would suggest that average choices would settle in the 3 to 4 range after the regulation was imposed, instead of being closer to 5. It is not clear why the Nash equilibrium would be a better predictor of average choices under a regulatory rule than in the no-communication setting. [Predominant risk-loving is a possible, but unsatisfactory explanation]. Clearly, the consequences of imposing and enforcing rules in laboratory settings needs further exploration.

Figure 2 shows mean group payoffs as a percent of the maximum attainable group payoff. The average efficiency of these groups fluctuated in a band (essentially 40 to 60 percent) around 50 percent when left to their individual choices with no regulation and no communication. When communication was permitted, they moved into the band of 60 to 80 percent efficient, averaging over 70 percent, and stayed there through the succeeding rounds.

When regulation was introduced instead of communication, the average jumped initially to a level above 90 percent efficient, but then declined to the 60 to 80 percent efficient range, and ultimately to the pre-regulation zone of 40 to 60 percent efficient. Moreover, as indicated earlier, in the aggregate the choices under this regulatory regime coincided remarkably well in those final rounds with the Nash expectations of choices producing 42 percent of the optimum welfare.

## **Discussion**

Many of our CPR public policy constructions since Hardin's [1968] "Tragedy of the

Commons" derive from the assumption that rational humans are hopelessly caught in dilemmas inescapable without inducements or sanctions imposed by an external authority. Many of such policies have failed miserably, sometimes even making the situation worse (Baland and Platteau [1996]). Evidence is mounting that policies based on an assumption that individuals can learn to cooperate when they help to design their own institutions may be more successful in practice. (Bromley *et al* [1992])

The growing CPR evidence from the laboratory confirms this view. Nash equilibria are not good predictors of behavior in these settings. CPR experimental results to date generally find higher efficiencies than Nash outcomes, but lower than optimum. They find greater cooperation from face-to-face communication than from communication by computer screen only. These findings have substantial implications for policy design in the areas of CPR.

The advantage of these laboratory experiments, of course, is that in the laboratory one can reduce the complexity of CPR problems in the field and vary a single variable at a time to focus on the stimulus and response. A potential drawback is that if the behavioral responses of the usual laboratory participants are different from those of individuals actually faced with a CPR problem, these strong results from the laboratory may have less import. Thus we have taken the very same methodology directly to the field, and have used participants made up of local citizens currently caught in a CPR dilemma. Our results are quite similar to the literature from laboratory experimental economics, and they offer one additional piece of evidence that communication can be a significant, if not potent, weapon in the battle against the tragedy of the commons.

Our findings also present a new bit of evidence of interest. While some experimental literature has explored the possibility that group-formed rules and sanctions may produce gains in

cooperation in an experimental setting, these experiments have not simulated the imposition of a government-imposed rule and sanction. The experiments with self-imposed rules by the group have shown general gains in efficiency. In contrast, our evidence from the laboratory in the field is that these initial gains in efficiency may be lost with time and experience, and may in fact approach the levels predicted by Nash outcomes, assuming modest expected penalties for violating externally-imposed rules. To the extent that this situation characterizes a great number of the government programs for monitoring and enforcement in environmental and CPR areas, clearly additional experimental research is called for in this subject.

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## Appendix

	0	1	2	3	4	5	6	7	8	
0	619	670	719	767	813	856	896	933	967	0
1	619	669	717	764	809	851	890	926	959	1
2	617	667	714	760	804	845	883	918	950	2
3	615	664	711	756	798	838	875	909	940	3
4	613	660	706	750	792	831	867	900	929	4
5	609	656	701	744	784	822	857	889	917	5
6	605	651	695	737	776	813	847	877	905	6
7	600	645	688	729	767	803	836	865	891	7
8	595	638	680	720	757	792	824	852	877	8
9	588	631	672	711	747	780	811	838	862	9
10	581	623	663	700	735	768	797	823	846	10
11	573	614	653	689	723	755	783	808	830	11
12	565	605	642	678	711	741	768	792	813	12
13	556	594	631	665	697	726	752	775	795	13
14	546	583	619	652	683	711	736	758	776	14
15	536	572	606	638	668	695	719	739	757	15
16	525	560	593	624	653	678	701	721	737	16
17	513	547	579	609	636	661	683	701	717	17
18	501	534	565	594	620	643	664	681	696	18
19	488	520	550	578	603	625	645	661	674	19
20	475	506	535	561	585	606	625	640	653	20
21	461	491	519	544	567	587	605	619	630	21
22	447	476	502	527	548	567	584	597	608	22
23	433	460	485	509	529	547	563	575	585	23
24	418	444	468	490	510	527	541	553	561	24
25	402	428	451	472	490	506	520	530	538	25
26	387	411	433	453	470	485	498	507	514	26
27	371	394	415	434	450	464	476	484	490	27
28	355	377	396	414	430	443	453	461	466	28
29	338	359	378	395	409	421	431	438	442	29
30	322	341	359	375	389	400	409	415	418	30
31	305	324	341	355	368	378	386	392	394	31
32	288	306	322	336	347	357	364	368	371	32
33	272	288	303	316	327	335	341	345	347	33
34	255	270	284	296	306	314	319	323	324	34
35	238	253	266	277	286	293	297	300	300	35
36	221	235	247	257	265	272	276	278	278	36
37	205	218	229	238	245	251	254	256	255	37
38	189	200	211	219	226	231	233	234	233	38
39	173	184	193	201	206	211	213	213	212	39
40	157	167	175	182	188	191	193	193	191	40
41	142	151	159	165	169	172	174	173	171	41
42	127	135	142	148	152	154	155	154	152	42
43	113	120	126	131	134	136	137	136	133	43
44	99	106	111	115	118	119	119	118	115	44
45	86	92	96	100	102	103	103	101	99	45
46	73	78	82	86	87	88	88	86	83	46
47	61	66	69	72	73	74	73	71	68	47
48	51	54	57	59	60	61	60	58	55	48
49	40	44	46	48	49	48	47	45	43	49
50	31	34	36	37	38	37	36	34	32	50
51	23	25	27	28	28	28	27	25	23	51
52	16	18	19	20	20	19	18	17	15	52
53	10	12	12	13	13	12	11	10	8	53
54	6	7	7	7	7	7	6	5	4	54
55	2	3	3	3	3	3	2	2	1	55
56	0	1	1	1	1	1	0	0	0	56

MIS MESES EN EL BOSQUE

	0	1	2	3	4	5	6	7	8		
LOS	0	619	670	719	767	813	856	896	933	967	0
	1	619	669	717	764	809	851	890	926	959	1
	2	617	667	714	760	804	845	883	918	950	2
MES	3	615	664	711	756	798	838	875	909	940	3
	4	613	660	706	750	792	831	867	900	929	4
	5	609	656	701	744	784	822	857	889	917	5
DE	6	605	651	695	737	776	813	847	877	905	6
	7	600	645	688	729	767	803	836	865	891	7
	8	595	636	680	720	757	792	824	852	877	8
EL	9	588	631	672	711	747	780	811	838	862	9
	10	581	623	663	700	735	768	797	823	846	10
	11	573	614	653	689	723	755	783	808	830	11
LOS	12	565	605	642	678	711	741	768	792	813	12
	13	556	594	631	665	697	726	752	775	795	13
	14	546	583	619	652	683	711	736	758	776	14
EN	15	536	572	606	638	668	695	719	739	757	15
	16	525	560	593	624	653	678	701	721	737	16
	17	513	547	579	609	636	661	683	701	717	17
EL	18	501	534	565	594	620	643	664	681	696	18
	19	488	520	550	578	603	625	645	661	674	19
	20	475	506	535	561	585	606	625	640	653	20
BOS	21	461	491	519	544	567	587	605	619	630	21
	22	447	476	502	527	548	567	584	597	608	22
QUE	23	433	460	485	509	529	547	563	575	585	23
	24	418	444	468	490	510	527	541	553	561	24
	25	402	428	451	472	490	506	520	530	538	25
	26	387	411	433	453	470	485	498	507	514	26
	27	371	394	415	434	450	464	476	484	490	27
	28	355	377	396	414	430	443	453	461	466	28
	29	338	359	378	395	409	421	431	438	442	29
	30	322	341	359	375	389	400	409	415	418	30
	31	305	324	341	355	368	378	386	392	394	31
	32	288	306	322	336	347	357	364	368	371	32
	33	272	288	303	316	327	335	341	345	347	33
	34	255	270	284	296	306	314	319	323	324	34
	35	238	253	266	277	286	293	297	300	300	35
	36	221	235	247	257	265	272	276	278	278	36
	37	205	218	229	238	245	251	254	256	255	37
	38	189	200	211	219	226	231	233	234	233	38
	39	173	184	193	201	206	211	213	213	212	39
	40	157	167	175	182	186	191	193	193	191	40
	41	142	151	159	165	169	172	174	173	171	41
	42	127	135	142	148	152	154	155	154	152	42
	43	113	120	126	131	134	136	137	136	133	43
	44	99	105	111	115	118	119	119	118	115	44
	45	86	92	96	100	102	103	103	101	99	45
	46	73	78	82	86	87	88	88	86	83	46
	47	61	66	69	72	73	74	73	71	68	47
	48	51	54	57	59	60	61	60	58	55	48
	49	40	44	46	48	49	48	47	45	43	49
	50	31	34	36	37	38	37	36	34	32	50
	51	23	25	27	28	28	28	27	25	23	51
	52	16	18	19	20	20	19	18	17	15	52
	53	10	12	12	13	13	12	11	10	8	53
	54	6	7	7	7	7	7	6	5	4	54
	55	2	3	3	3	3	3	2	2	1	55
	56	0	1	1	1	1	1	0	0	0	56

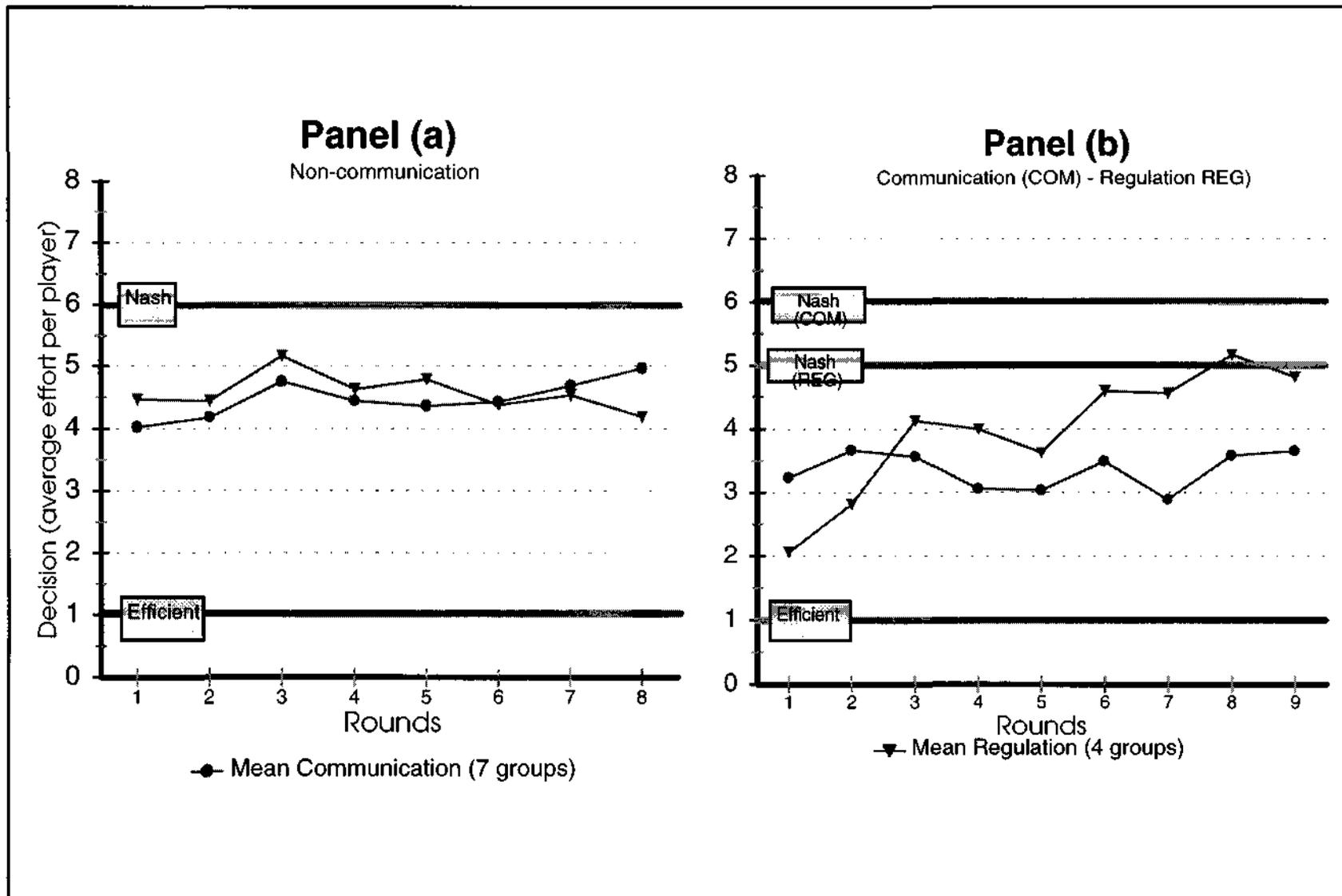


Figure 1. Average Individual Decisions. Panel (a) Non-Communication; Panel (b) Communication (COM) and Regulation (REG).

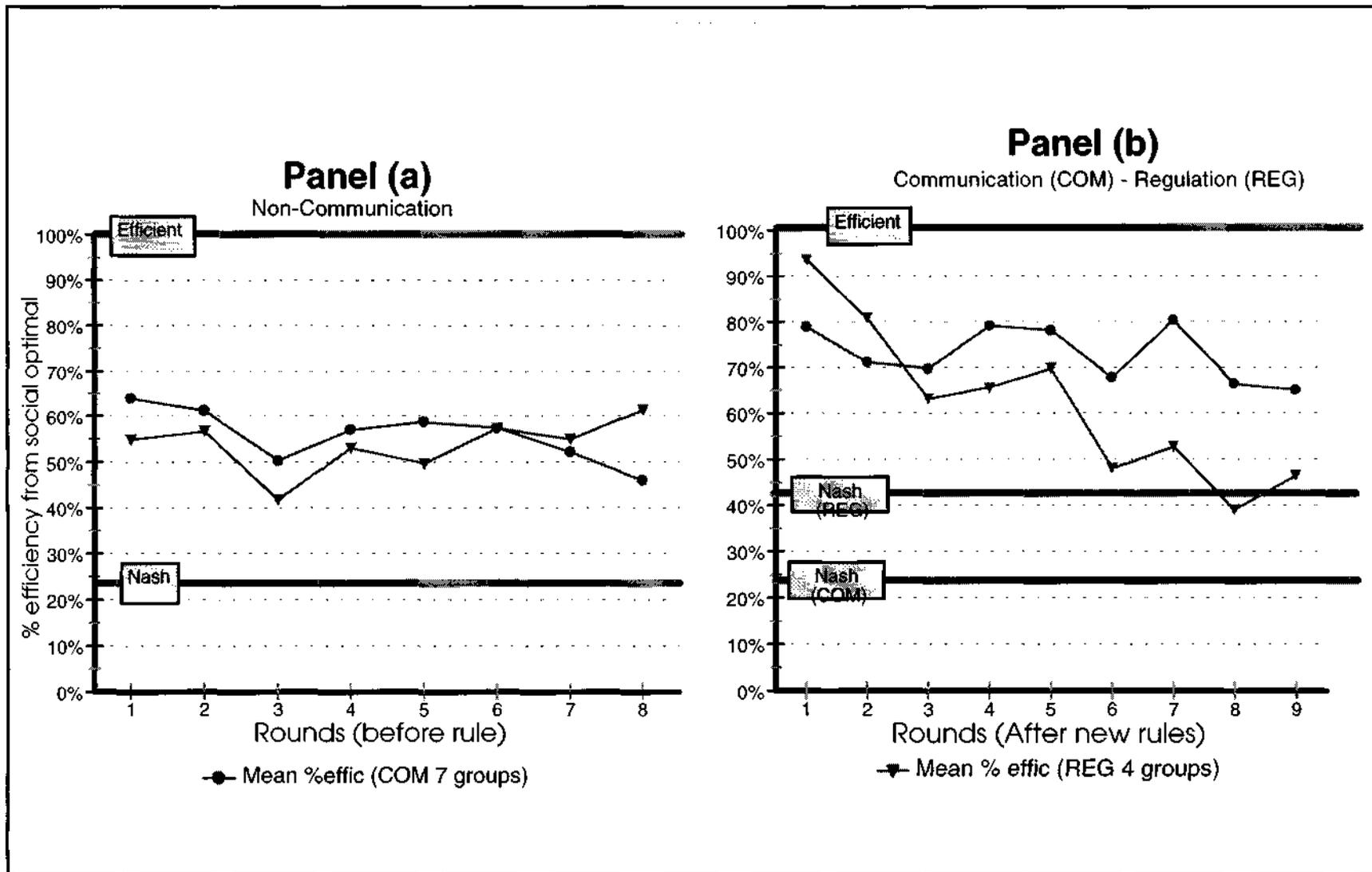


Figure 2. Group efficiencies as % of maximum yield. Panel (a) Non-Communication; Panel (b) Communication (COM) and Regulation (REG).

"Effectiveness of Communication and Regulation in Local Commons: Some Evidence from Experiments in the Field". Submitted to the Agricultural and Resource Economics Review.

### GAME INSTRUCTIONS (ENGLISH TRANSLATION)

Note to readers:

These instructions were originally written in Spanish and subsequently translated from the final version used in the field work. Three pre-test sets of rounds were performed with colleagues and field practitioners to fine-tune the wording of the instructions in the Spanish version used.

The instructions were read to the game participants from this script below by the same person (the first author) during all field experiments. The participants could interrupt and ask questions at any time.

Whenever the following type of text and font [...MONITOR: distribute **PAYOFFS TABLE** to participants...] is found below, it refers to specific instructions to the monitor at that specific point. These were not read to participants. Notes in *italics* are added to clarify issues to the reader. These were not read to participants. Where the word "poster" appears, it refers to a set of posters we printed in very large format with the payoffs table, forms, and the three examples described in the instructions. These posters were fastened to a wall near the participants' desks.

# **COMMUNITY RESOURCES GAME**

## **(Instructions)**

(Version SYMM-2.4 - June 21, 1998)

Greetings...

We want to thank everyone here for attending, and especially the field practitioner \_\_\_\_\_ (*name of the contact person in that community*), and \_\_\_\_\_ (*local organization that helped in the logistics*) who made this possible. We should spend about two hours in explaining the game, playing it and finishing with a short survey at the end of the game. So, let us get started.

The following game is a way of participating actively in a project about the economic decisions of individuals. Besides participating in the game, and being able to earn some prizes and some cash, you will participate in a community workshop in two days to discuss the game and other matters about natural resources. During the day of the workshop we will give you the earnings you will make during the game. Besides a basic prize for signing up and participating (examples: flash lamps, machetes, school kits, home tools), you will receive a bonus that will be converted into cash for purchases for your family. The funds to cover these expenditures have been donated by various organizations that support this study among which are the Instituto Humboldt, el Fondo Mundial para la Protección de la Naturaleza, y la Fundación Natura.

### **I. Introduction**

This game attempts to recreate a situation where a group of families must make decisions about how to use the resources of, for instance, a forest, a water source, a mangrove, a fishery, or any other case where communities use a natural resource.

In the case of this community \_\_\_\_\_ (name of the specific village), an example would be the use of firewood or logging in the \_\_\_\_\_ (name of an actual local commons area in that village) zone.

You have been selected to participate in a group of 8 people. The game in which you will participate now is different from the ones others have already played in this community, thus, the comments that you may have heard from others do not necessarily apply to this game.

You will play for several rounds that we might consider equivalent to years or harvest seasons. At the end of the game you will be able to earn some prizes in kind and cash. The cash prizes will depend on the quantity of points that you accumulate after several rounds.

### **II. The PAYOFFS TABLE**

To begin play, you will receive a **PAYOFFS TABLE** like the one shown in the poster.

[...MONITOR: show PAYOFFS TABLE in the poster at the wall...]

[...MONITOR: distribute PAYOFFS TABLE to participants...]

This table contains all the information that you need to make your decision in each round of the game. The numbers that are inside the table correspond to points (or pesos) that you would earn in each round. The only thing that each of you has to decide in each round is the number of MONTHS that you want to allocate EXTRACTING THE FOREST (in the columns from 0 to 8).

To play in each round you must write your decision between 0 and 8 in a yellow GAME CARD like the one I am about to show you.

[...MONITOR: show yellow GAME CARDS and show in the poster...]

It is very important that you keep in mind that the decisions are absolutely individual; that is, that the numbers you write in the game card are private and that you do not have to show them to the rest of members of the group if you do not want to.

The monitor will collect the 8 cards from all participants, and will add the total of months that the group decided to use extracting the forest. When the monitor announces the group total, each of you will be able to calculate the points that you earned in the round. Let us explain this with an example.

In this game we assume that each player has available a maximum of 8 MONTHS to work each year extracting a resource like firewood or logs. In reality this number could be larger or smaller but for purposes of our game we will assume 8 as maximum. In the PAYOFFS TABLE this corresponds to the columns from 0 to 8. Each of you must decide on a number from 0 to 8 in each round. But to be able to know how many points you earned, you need to know the decisions that the rest in the group collectively made. That is why the monitor will announce in each round the total for the group.

For instance, if you decide to use 2 months in the forest and the decisions of rest of the group together added to 20 months in the forest, you would gain\_\_\_\_\_points. Let us look at two other examples in the poster.

[...MONITOR: show poster with the THREE EXAMPLES...]

*(...see examples in the POSTER below)*

Let us look at how the game works in each round.

### III. The DECISIONS FORM

To play each participant will receive one green DECISIONS FORM like the one shown in the poster in the wall. We will explain how to use this sheet.

[...MONITOR: show the **DECISIONS FORM** in the poster...]

[...MONITOR: distribute the **DECISIONS FORMS...**]

With the same examples, let us see how to use this DECISIONS FORM. Suppose that you decided to play 5 in this round. In the yellow GAME CARD you should write 5. Also you must write this number in the first column A of the decisions form.

The monitor will collect the 8 yellow cards and will add the total of the group. Suppose that the total added 26 months. Thus, we write 26 in the column B of the decisions form.

[...MONITOR: In the poster, write the same example numbers in the respective cells...]

To calculate the third column (C), we subtract from the group total, MY MONTHS IN THE FOREST and then we obtain THEIR MONTHS IN THE FOREST which we write in column C. In our example,  $26 - 5 = 21$ .

If we look at the PAYOFFS TABLE, when MY MONTHS are 5 and THEIR MONTHS are 21, I earn \_\_\_\_ points. I write this number in the column D of the DECISIONS FORM.

It is very important to clarify that nobody, except for the monitor, will be able to know the number that each of you decide in each round. The only thing announced in public is the group total, without knowing how each participant in your group played.

Let us repeat the steps with a new example.

[...MONITOR: Repeat with the other two examples, writing the numbers in the posters hanging in the wall...]

It is important to repeat that your game decisions and earnings information are private. Nobody in your group or outside of it will be able to know how many points you earned or your decisions during rounds.

We hope these examples help you understand how the game works, and how to make your decisions to allocate your MONTHS in each round of the game. **If at this moment you have any question about how to earn points in the game, please raise your hand and let us know.**

[...MONITOR: pause to resolve questions...]

It is very important that while we explain the rules of the game you do not engage in conversations with other people in your group.

If there are no further questions about the game, we will assign the numbers for the players and the rest of the forms needed to play.

#### **IV. THE ACCEPTANCE FORM:**

In the following acceptance letter you will receive a number which will be your **PLAYER NUMBER** from now on. In each round you must use this number and not your name. Besides, you will receive a stack of yellow **GAME CARDS** with your player number. Please check that these have the same player number assigned to you.

[MONITOR: Distribute the packets with the **ACCEPTANCE FORMS** and the **GAME CARDS**. Hand out consecutively from 1 to 8 according to seating]

[MONITOR: read the **ACCEPTANCE LETTER**]

*(...see **ACCEPTANCE LETTER** translation below)*

The information in this form is confidential and nobody will have access to it, except for the principal researcher in this study. This format is important for us to be able to give you the prize when the game ends since your name is in it.

If you agree in participating, please sign your **ACCEPTANCE FORM** and remember your player number which you will use in the game rounds. Please hand in the signed form to the monitor.

[MONITOR: Collect the **ACCEPTANCE FORMS**]

#### **V. Preparing for playing:**

Now write down your player number in the green **DECISIONS FORM**. Write also the place \_\_\_\_\_ and the current date and time \_\_/\_\_/\_\_,\_\_:\_\_am/pm.

Likewise, write in the letter (S, L or H) in the upper right of the **PAYOFFS TABLE** you received.

In the following poster we summarize for you the steps to follow to play in each round. Please raise your hand if you have a question.

[MONITOR: Read the steps to them from the poster]

Before we start, and once all players have understood the game completely, the monitor will

announce one additional rule for this group.

Monitor:

- All groups should start with Rule A (see below)
- If this is a symmetric game use Tables S.
- If this is a asymmetric game, assign randomly the two H tables and the six L tables. Then post Rule D (see below)

To start the first round of the game we will organize the seats and desks in a circle where each of you face outwards. The monitor will collect in each round your yellow game cards.

Finally, to get ready to play the game, please let us know if you have difficulties reading or writing numbers and one of the monitors will seat next to you and assist you with these.

Also, please keep in mind that from now on no conversation or statements should be made by you during the game.

We will have first a few rounds of practice that will NOT count for the real earnings.

## ACCEPTANCE FORM

Player No. \_\_\_\_\_

You have been invited to participate in this game which is part of a study on the management of natural resources. Participation of people like you, who are in permanent contact with the management of natural resources, is very important. Thanks to your participation in the game and the discussion that we will have in a workshop in two days, we can all contribute and learn from this study. The funding for the project comes from different national and international institutions like the World Wildlife Fund, Fundacion NATURA, and the Instituto Humboldt.

The approximate duration of this game session is one hour and a half. The next day we hope that the workshop takes approximately three hours, and we will provide snacks for the group.

You will earn prizes according to the points you make. At the end of the game you will have to answer a few questions about the game. Both the prizes and the information about the way you played the game will be private and confidential.

In the second day after all the games finish, we will get together again to discuss some of the results from the games. Besides, that day we will hand the cash prizes that each person earned today. The workshop will be held on \_\_\_\_\_ (Day and time) at \_\_\_\_\_ (meeting place).

Your participation in this exercise is completely voluntary. You can leave the room at any moment. However, if you decide to leave, you will not be able to receive prizes.

ACCEPTANCE: (Please type)

I, \_\_\_\_\_ declare that I understand the information above and my rights and duties during this exercise. Also I am aware that I can leave at any moment of the game and forego the earnings at the end. I certify that I have received a copy of this acceptance letter.

Signed, \_\_\_\_\_

I, JUAN CAMILO CARDENAS, certify that this information will be used in confidentiality and for academic and educational purposes and for the benefit of communities regarding problems of natural resources. I also certify that each participant will receive a basic (show-up) prize and an additional cash prize equivalent to the number of points that the player earned at the end of the game. These prizes will be handed the day of the workshop.

Signed, JUAN CAMILO CARDENAS

Place and date, \_\_\_\_\_ Time game starts \_\_\_\_:\_\_\_\_AM/PM

**POSTERS THAT WERE POSTED IN THE WALLS:**

POSTER 1: PAYOFFS TABLE (See appendix in the paper)

POSTER 2: DECISIONS FORM and GAME CARD samples

POSTER 3: THREE EXAMPLES OF HOW THE PAYOFFS TABLE WORKS

POSTER 4: SUMMARY OF STEPS FOR PLAYING ONE ROUND OF THE GAME

This posters were on a wall near all the players throughout the game.

**RULES CARDS:**

Rule A: THERE IS NO COMMUNICATION WITHIN THE GROUP

Rule B: COMMUNICATION WITH MEMBERS OF THE GROUP

Rule C: EXTERNAL REGULATION

These cards were shown also in large format posters and read to the players at the appropriate moment. Rule B and C cards were read in the middle of the session depending on the group.

## DECISIONS FORM

**PLAYER NUMBER:** \_\_\_\_\_ **PAYOFFS TABLE (S,L,H):** \_\_\_\_\_  
**Date:** \_\_\_/\_\_\_/\_\_\_ **Time** \_\_\_ AM/PM **Place:** \_\_\_\_\_

	Column A	Column B	Column C	Column D
Round No.	<b>MY MONTHS IN THE FOREST</b>  (From your decision)	<b>TOTAL GROUP MONTHS IN THE FOREST</b> (Announced by the Monitor)	<b>THEIR MONTHS IN THE FOREST</b>  [Column B minus Column A]	<b>MY TOTAL POINTS IN THIS ROUND</b> (Use your PAYOFFS TABLE)
Practica				
Practica				
Practica				
1				
2				
3				
4				
5				
14				
15				
<b>Total</b>				

GAME CARD (Examples):

<b>GAME CARD</b>	
PLAYER NUMBER:	<b>1</b>
ROUND NUMBER:	
MY MONTHS IN THE FOREST:	

POSTER 3: THREE EXAMPLES OF HOW THE PAYOFFS TABLE WORKS

		<b>MY MONTHS IN THE FOREST</b>									
		<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	
<b>THEIR MONTHS IN THE FOREST</b>	<b>0</b>	6,189	6,699	7,194	7,671	8,126	8,557	8,959	9,332	9,671	
	<b>1</b>	6,186	6,687	7,174	7,641	8,087	8,507	8,899	9,261	9,590	
	<b>11</b>	5,734	6,140	6,528	6,893	7,233	7,546	7,829	8,081	8,299	
	<b>20</b>	4,750	5,058	<b>5,345</b>	5,610	5,850	6,063	6,248	6,402	6,525	
	<b>21</b>	4,613	4,910	5,186	5,440	5,669	<b>5,871</b>	6,045	6,189	6,303	
	<b>30</b>	3,217	3,415	3,593	3,751	3,886	3,999	4,086	4,148	4,184	
	<b>45</b>	857	916	963	999	1,022	1,033	1,030	1,014	985	
	<b>50</b>	313	340	360	372	377	374	363	344	<b>319</b>	

**Example 1:**

- I decide that MY MONTHS IN THE FOREST will be 5.
- The rest of my group, together, play 21 as THEIR MONTHS IN THE FOREST.
- I then earn \_\_\_\_ points.

**Example 2:**

- I decide that MY MONTHS IN THE FOREST will be 2.
- The rest of my group, together, play 20 as THEIR MONTHS IN THE FOREST.
- I then earn \_\_\_\_ points.

**Example 3:**

- I decide that MY MONTHS IN THE FOREST will be 8.
- The rest of my group, together, play 50 as THEIR MONTHS IN THE FOREST.
- I then earn \_\_\_\_ points.

## **COMMUNITY RESOURCES GAME** **(Summary Instructions)**

**Objective of the game:** To earn as many points as possible at the end of the rounds, which will be converted into cash prizes for your household.

**How is it played:** In each round, you must decide how many months in a year between 0 and 8, you want to devote to extract resources from a forest. The points you earn in each round depend on your decision and the decisions by the rest of the group, according to the **PAYOFFS TABLE** (blue table).

**What do you need:** To play you need a blue **PAYOFFS TABLE**, a green **DECISIONS FORM**, and several yellow **GAME CARDS**. Also you need a player number.

### **Steps to play in each round:**

1. Using the blue **PAYOFFS TABLE**, decide how many **MONTHS IN THE FOREST** you will play.
2. In the **DECISIONS FORM** write your decision (**MY MONTHS IN THE FOREST**) in Column A for the round being played at that moment.
3. In a yellow **GAME CARD** write the round number, and your decision **MY MONTHS IN THE FOREST**. Make sure it corresponds to the **DECISIONS FORM**. Hand the yellow game card to the monitor
4. Wait for the Monitor to calculate the total from all the cards in the group. The Monitor will announce the **TOTAL GROUP MONTHS**.
5. In the green **DECISIONS FORM** write this total in Column B (**TOTAL GROUP MONTHS IN THE FOREST**).
6. In the green **DECISIONS FORM** calculate Column C (**THEIR MONTHS IN THE FOREST**) equals to Column B minus Column A.
7. In the green **DECISIONS FORM** write in Column D the total points you earned for this round. To know how many points you made, use the **PAYOFFS TABLE** and columns A and C (**MY MONTHS** and **THEIR MONTHS**). We will also calculate this quantity with the yellow cards to verify.
8. Let us play another round (Go back to step 1).

## Rule A:

### **THERE IS NO COMMUNICATION WITHIN THE GROUP**

Besides the rules described in the instructions that we just explained, there is an additional rule for the participants in this group:

You will not be able to communicate with any member of your group before, during or after you make your individual decision in each round. **Please do not make any comment to another participant or to the group in general.** After the last round we will add the points you earned in the game.

## Rule B:

### **COMMUNICATION WITH MEMBERS OF THE GROUP**

Besides the rules described in the instructions that we just explained, there is an additional rule for the participants in this group:

Please make a circle or sit around a table with the rest of your group. Before making your decision in each round, you will be able to have an open discussion of maximum 5 minutes with the members of your group. You will be able to discuss the game and its rules in any fashion, except you **cannot use any promise or threat or transfer points. Simply an open discussion.** The rest of the rules hold.

We will let you know when the 5 minutes have ended. Then you will suspend the conversation and should make your individual decision for the next round. These decisions will still be private and individual as in the past rounds and cannot be known to the rest of the group or other people.

## **Rule C: EXTERNAL REGULATION**

Besides the rules described in the instructions that we just explained, there is an additional rule for the participants in this group:

This new rule is for making everyone obtain the maximum points possible for the group. Let us try to guarantee that each player in your group plays 1 MONTH IN THE FOREST. If a player were to play more than one month we will impose a penalty for each additional month he plays in the forest.

However, it would be very difficult to inspect all members of a community. Thus, we will select one of you randomly in your group approximately half of the rounds. Only those selected will have to show (to the monitor only) how many MONTHS IN THE FOREST they decided to play.

For instance, suppose that the penalty is 500 points for each additional month. If a player is selected randomly, and he had played 3 MONTHS IN THE FOREST, the monitor will subtract 1,000 points from her total points earned in that round.

The monitor will now announce how many points the penalty will be for each month above 1, and how the player to be inspected will be chosen.

**Monitor:**

To choose who will be inspected in the game by the regulator we will follow these steps:

- The monitor will throw one die. If an EVEN number, we will continue playing and no one will be inspected.
- If an ODD number, one of the eight players will be inspected. In one bag we will have eight game cards with their eight player numbers, and we will chose one randomly who will be inspected by the monitor only.
- In case the inspected one played 2 or more months, he will receive a penalty of 100 points for each additional month above 1.

Paquete de Instrucciones JUEGO DE LOS RECURSOS COMUNITARIOS  
(VERSION EN ESPAÑOL)

Junio, 1998

Juan Camilo Cardenas (University of Massachusetts - Amherst)

Este paquete de instrucciones incluye:

1. **ANUNCIO DE INVITACION** a participar en el juego.
2. **INSTRUCCIONES PARA EL MONITOR**
3. Estas **INSTRUCCIONES DEL JUEGO** que deben ser leídas a los participantes.
4. **AFICHES DE INSTRUCCIONES Y FORMATOS** para ser colocados en las paredes donde se haga el juego.
  1. **TABLA DE PUNTOS**
  2. **HOJA DE DECISIONES**
  3. **TARJETAS DE JUEGO**
  4. Tres Ejemplos de decisiones y puntos
  5. Pasos para jugar en cada ronda
  6. Regla A: No hay comunicación
  7. Regla B: Comunicación en el grupo (sin transferencias)
  8. Regla C: Regulación externa (multa y probabilidad de ser inspeccionado)
  9. Regla D: Juego asimétrico (2 Tablas de Puntos)
5. **EL FORMATO DE ACEPTACION PARA PARTICIPAR.** En este formato se le asigna **EL NUMERO DE JUGADOR** a cada participante.
6. El **HOJA DE DECISIONES** (papel verde). Donde el participante lleva registro de sus decisiones y puntos ganados durante el juego.
7. Las **TARJETAS DE JUEGO** (amarillas) que cada jugador debe llenar en cada ronda del juego con su decisión individual y entregar al monitor.
8. La **TABLA DE PUNTOS** (azul) que debe ser distribuida a cada participante. (En el caso del juego simétrico hay una sola, en el caso asimétrico hay dos diferentes.
9. **EL FORMATO DE JUEGO DEL GRUPO** que el monitor debe llenar (como soporte al archivo electrónico).
10. **EL FORMATO DE PUNTOS DEL GRUPO** que el monitor debe llenar (como soporte al archivo electrónico).
11. La **ENCUESTA AL FINAL DEL JUEGO** que deben llenar los participantes al terminar las rondas del juego.

## **INVITACION A PARTICIPAR EN EL JUEGO DE LOS RECURSOS NATURALES**

Estamos invitando a personas de esta comunidad a participar en un juego acerca de los recursos naturales de esta región.

Al participar, podrá aprender y aportar a este estudio, y podrá ganar algunos premios para Usted y su familia.

En otras ocasiones que hemos jugado el juego, cada participante ha ganado premios equivalentes a 1 o 2 jornales diarios.

El estudio ha sido apoyado por entidades como el Fondo para la Protección de la Naturaleza, la Fundación Natura y el Instituto Humboldt.

Lugar: \_\_\_\_\_ Fecha: \_\_\_\_\_ Hora:

Duración: Aproximadamente 2 horas

Se darán refrigerios a los participantes inscritos. Quienes lleguen a tiempo para el horario en que se inscribieron, recibirán un premio básico (ejemplos: linternas, camisetas, útiles escolares, machetes, etc.)

Reglas:

Quienes se inscriban y participen en el juego se comprometen a:

- Jugar el juego por un tiempo de aproximadamente 1 hora.
- Responder unas preguntas sobre el juego al finalizar
- Participar en un taller de discusión sobre el juego y los resultados (en este taller se haría entrega de los premios que los jugadores ganaron durante el juego)

# "RIFAS, JUEGOS, TALLERES SOBRE LOS RECURSOS NATURALES DE LAS COMUNIDADES!!!!!!"

## **El Proyecto Bejuco invita**

a todas las personas interesadas a participar en una nueva serie de actividades relacionadas con el proyecto y que pueden ser de utilidad para avanzar en la discusión de los aspectos sociales y de la resolución de intereses en el manejo de los recursos naturales en la región.

Gracias al apoyo del Instituto Humboldt, las UMATAS y la CRQ, estaremos realizando unas dinámicas de grupos durante la semana del martes 21 al viernes 24 de julio en Filandia y Circasia.

**JUEGOS:** Quienes se inscriban para participar en unos juegos didácticos podrán ganar boletas para participar en rifas de algunos premios de utilidad para la casa.

**Cuándo?** Estaremos realizando los juegos los días martes 21 en Circasia (Sede de la UMATATA); y el día miércoles 22 en Filandia (Salón Artesanal) a partir de las 6PM.

**TALLER:** El día jueves 23 están invitados todos los participantes de los juegos y demás interesados a contribuir en un taller de discusión sobre los juegos, sus aplicaciones al problema de los recursos naturales.

**Cuando?** El taller se realizará el jueves 23 de julio a las 6pm en la sede de

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Tanto para los Juegos como para el Taller ofreceremos refrigerios y bebidas.

Inscripciones: Durante el día Martes 21 estaremos contactando a las personas interesadas para hacer las inscripciones para los juegos de la

noche del mismo martes y el miércoles.

Los esperamos!!!!

Informes: UMATA de Circasia, CRQ, Instituto Humboldt.

# **JUEGO DE LOS RECURSOS COMUNITARIOS**

## **(Instrucciones)**

(Version SYMM-2.4 - Junio 21, 1998)

Saludos...

El siguiente juego es una forma diferente y entretenida de participar activamente en un proyecto sobre las decisiones económicas de las personas. Además de participar en el juego, y de poder ganar algunos premios y algo de dinero, Usted participará en un taller de trabajo dentro de dos días para discutir el juego y otros asuntos de los recursos naturales. El día del taller haremos la entrega de los premios ganados en el juego. Además de un premio básico por inscribirse y participar (ejemplos: \_\_\_\_\_) Usted recibirá un "bono" que podrá convertir en compras para su familia. Los fondos para cubrir estos gastos han sido donados por varias organizaciones de apoyo al estudio entre las cuales están el Instituto Humboldt, el Fondo Mundial para la Protección de la Naturaleza, y la Fundación Natura.

### **I. Introducción**

Este juego trata de recrear una situación en la que un grupo de familias debe tomar decisiones sobre como aprovechar los recursos de por ejemplo un bosque, una fuente de agua, un manglar, una zona de pesca, o cualquier otro caso de recursos naturales que usan las comunidades.

En el caso de esta comunidad, la de \_\_\_\_\_, un ejemplo sería el caso del aprovechamiento del recurso \_\_\_\_\_ en la zona de \_\_\_\_\_.

Usted ha sido escogido para participar en un grupo de 8 personas entre las personas que se inscribieron a jugar. El juego en que Usted va a participar ahora es diferente al que otros grupos han jugado en esta comunidad, así que los comentarios que haya oído de otras personas no aplican necesariamente para este juego.

Ustedes jugarán por varias rondas equivalentes, por ejemplo, a años o temporadas de cosecha. Al final del juego Usted podrá ganar algunos premios en especie (ejemplos \_\_\_\_\_) o dinero. Los premios dependen de la cantidad de puntos que acumule después de jugar varias rondas.

### **II. La TABLA DE PUNTOS**

Para poder jugar Usted recibirá una **TABLA DE PUNTOS** igual a la que se muestra en la cartelera.

[...MONITOR: mostrar cartelera con **TABLA DE PUNTOS**...]

[...MONITOR: distribuir las ocho **TABLAS DE PUNTOS**...]

Esta tabla tiene toda la información que se necesita para tomar la decisión en cada ronda del juego. Los números que están dentro de la tabla corresponden a puntos (o pesos) que Usted se ganaría en cada ronda. Lo único que cada uno de Ustedes tiene que decidir en cada ronda es el número de MESES que quiere utilizar APROVECHANDO EL BOSQUE (en las columnas de 0 a 8).

Para jugar en cada ronda Usted deberá escribir su número entre 0 y 8 en una TARJETA DE JUEGO amarilla como la que les voy a mostrar.

[...MONITOR: mostrar TARJETAS DE JUEGO amarillas y cartelera...]

Es muy importante que tengamos en cuenta que las decisiones son totalmente individuales, es decir, que los números que escribamos en la tarjeta de juego son privados y no tenemos que mostrarlos a los demás miembros del grupo si no queremos.

El monitor recogerá las 8 tarjetas de todos los participantes, y sumará el total de meses que el grupo decidió utilizar para aprovechar el bosque. Cuando el monitor anuncie el total del grupo cada uno podrá calcular los puntos que se ganó en la ronda. Esto lo vamos a explicar con un ejemplo.

En este juego vamos a asumir que cada jugador tiene disponibles máximo 8 MESES para trabajar aprovechando un recurso como \_\_\_\_\_. En la realidad este número podría ser mayor o menor, pero para nuestro juego asumiremos que son 8 meses máximo. En la TABLA esto corresponde a las columnas de 0 a 8. Cada uno de Ustedes debe decidir entre 0 y 8 en cada ronda. Pero para poder saber cuántos puntos ganará finalmente, deberá saber las decisiones que tomaron los demás de su grupo. Para eso el monitor anunciará en cada ronda cuánto fue el total del grupo.

Por ejemplo, si Usted decide utilizar 2 meses en el bosque y el resto de su grupo, todos juntos, suman 20 meses en el bosque, Usted se ganaría \_\_\_\_\_ puntos. Miremos los otros dos ejemplos en la cartelera.

[...MONITOR: mostrar cartelera con TRES EJEMPLOS...]

Miremos cómo funciona el juego en cada ronda.

### **III. La HOJA DE DECISIONES**

Para poder jugar cada jugador recibirá una HOJA DE DECISIONES color verde como la que se muestra en la cartelera. Vamos a explicar cómo se usa esta hoja.

[...MONITOR: mostrar cartelera con HOJA DE DECISIONES...]

[...MONITOR: repartir las HOJAS DE DECISIONES verdes...]

Con los mismos ejemplos, miremos cómo se utiliza esta HOJA DE DECISIONES. Supongamos que Usted decidió jugar 5 en esta ronda. En la TARJETA DE JUEGO amarilla deberá escribir 5. También

debe escribir este número en la primera columna A de la hoja de decisiones.

El monitor recogerá las 8 tarjetas amarillas y sumará el total del grupo. Supongamos que el grupo en total sumó 26 meses. Entonces escribimos 26 en la columna B de la hoja de decisiones.

[...MONITOR: En una cartelera escribir el ejemplo (5 + siete casillas en blanco = 26 meses)...]

Para calcular la tercera columna (C), restamos al total del grupo MIS MESES EN EL BOSQUE y así obtenemos los MESES DE ELLOS EN EL BOSQUE que escribimos en la columna C. En nuestro ejemplo,  $26 - 5 = 21$ .

Si miramos en la TABLA DE PUNTOS, cuando MIS MESES son 5 y los MESES DE ELLOS son 21, yo me gano \_\_\_\_ puntos. Ese número lo anoto en la columna D de la HOJA DE DECISIONES.

Es muy importante aclarar que nadie podrá, excepto el monitor, conocer el número que cada uno de Ustedes decida en cada ronda. Lo único que se anuncia es el total del grupo, sin saber exactamente como jugó cada participante de su grupo.

Repitamos los pasos con un nuevo ejemplo.

[...MONITOR: Repetir con los otros dos ejemplos...]

Es importante repetir que la información de sus jugadas y de los puntos que gane es privada. Nadie en su grupo o por fuera de él podrá saber cuántos puntos se ganó o que jugadas hizo durante las rondas.

Esperamos que estos ejemplos le ayuden a entender como funciona el juego, y como puede tomar sus decisiones para utilizar sus MESES en cada ronda del juego. **Si en este momento tiene alguna pregunta acerca de como se ganan puntos en el juego, por favor levante la mano y haganos saberlo.**

[...MONITOR: pausa para resolver preguntas...]

Es muy importante que mientras explicamos las reglas del juego Usted no se distraiga en conversaciones con otras personas del grupo.

Si no hay mas preguntas acerca de cómo funciona el juego, entonces vamos a distribuir los números de los jugadores y las demás hojas que se necesitan para jugar.

#### **IV. LA HOJA DE ACEPTACION:**

En la siguiente carta de aceptación a jugar Usted recibirá un número que será su NUMERO DE