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**Analyzing negotiation approaches in natural resource management -**

**A case study of crop-livestock conflicts in Sri Lanka**

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***Contributed Paper selected for presentation at the 25<sup>th</sup> International  
Conference of Agricultural Economists, August 16-22, 2003,  
Durban, South Africa***

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## **Analyzing negotiation approaches in natural resource management**

### **- A case study of crop-livestock conflicts in Sri Lanka -**

#### **Abstract**

Participatory approaches in natural resource management are increasingly being criticized for their tendency to neglect power relations and conflicts of interests. Negotiation approaches have been proposed as a strategy to overcome such shortcomings. The increasing practical relevance of negotiation in natural resource management requires the development of theoretical concepts for analyzing the nature and outcome of such negotiation processes. Using the case of negotiations concerning crop-livestock conflicts in Sri Lanka as an empirical example, this paper applies the concept of political capital in combination with game theoretical modeling for an analysis of negotiation processes in natural resource management. An extended form game is used to examine the incentive structure of the resource users and the political decision-makers involved in the negotiation process. The pay-off of the resource users is measured in economic terms, while the pay-off of the political decision-makers is expressed in terms of political capital. The modeling exercise shows how the incentives of the resource users and the politicians depend on the probability that the public administration enforces a negotiated outcome. The paper discusses potential extensions of the model and concludes that the concept of political capital, in combination with game theoretical modeling, provides a useful tool for the analysis of negotiation approaches in natural resource management.

JEL Classification Code: Q2

Key Words: natural resource management, negotiation, political capital, extensive form game, Sri Lanka

## **1 Introduction**

Within the last decade, negotiated agreements between resource users, state agencies and other stakeholders have become increasingly important in natural resource management in developing countries (see, e.g., Venema and Breemer, 1999; Bruns and Meinzen-Dick, 2000). This trend towards negotiation in natural resource management can be seen in the context of an increasing criticism of conventional participatory approaches, which are charged for neglecting power relations and conflicts of interests (Leeuwis, 2000; Agrawal, 2001; Cook and Kothari, 2001). To overcome problems caused by power relations, negotiation approaches make use of measures such as (1) a strategic selection of participants, (2) exercising pressure on certain stakeholders, (3) imposing sanctions if actors do not follow agreed rules, and other procedures that are not typically found in the tool-box of participatory approaches (Leeuwis, 2000; Edmunds and Wollenberg, 2001). The increasing practical relevance of negotiation in natural resource management requires the development of theoretical concepts that allow scholars and practitioners to analyze the nature and the outcome of such negotiation processes. Using the case of negotiations on crop-livestock conflicts in Sri Lanka as an empirical example, this paper explores the usefulness of the concept of political capital in combination with a game theoretical model in extended form for an analysis of negotiation processes in natural resource management.

## **2 Research area and methods**

The case study on conflicts between crop farmers and livestock keepers was conducted in the semi-arid zone of Hambantota District in the South of Sri Lanka. The prevailing land use system in this region is characterized by the co-existence of three major land use systems: (1) intensive irrigated paddy cultivation; (2) slash and burn agriculture on non-irrigated land resources, which is referred to as chena cultivation in Sri Lanka. The majority of the households in the research region depend on this type of land use for their subsistence. (3) The

keeping of large cattle and buffalo herds (comprising up to several hundred animals) in an extensive, pastoral system. This type of livestock keeping is concentrated in the hands of comparatively few wealthy families.

A major driving force of change in the region is the increasing population density, which almost doubled from 106 to 204 persons per square km between 1971 and 1994 (Hambantota District Office, 1994). The reduction of fallow periods and overstocking has led to increasing soil degradation (Wickremasinghe, 1987). A solution to this problem is the expansion of the irrigated area and the transition from chena cultivation to more sustainable permanent cultivation systems that include, for example, the planting of legume trees along contour bounds and the integration of tree crops. Several development projects and NGOs have developed such land use systems. They recorded considerable interest on part of the chena farmers to switch to such land use practices. However, the problem of crop damage caused by the free grazing cattle and buffalo herds proved to be a major barrier to the adoption of such more sustainable land use practices (HARTI, 1995; IIMI, 1995). As state regulations were not successful in solving the problem, a negotiation process was started in 1994, which will be analyzed in this paper.

The study is based on empirical data collection in Hambantota District in 1994/1995 and 1998. The research methods applied in 1994/95 included: a survey of all livestock keeping households in eight selected villages (207 households); participant observation over a period of twelve months in one of the selected villages; interviews with crop farmers affected by crop damage in the selected villages; interviews with village headmen of other villages affected by crop damage; interviews with representatives of the local farmers' and livestock keepers' organizations, administrative officers, policemen, local politicians and representatives of NGOs and development projects; observation of the election campaigns in 1994. In 1998, interviews

were held with key persons involved into the negotiation process that took place to solve the conflict between crop farmer and livestock keepers.

### **3 A negotiation approach to solve the crop-livestock conflict**

As interviews with livestock keepers showed, they perceived that they had customary property rights in fallow land that were violated both by the expansion of the area under irrigation and by the transition of chena farming to permanent cropping systems. Therefore, they were not prepared to take actions to reduce the crop damage caused by their herds. According to a stray animal legislation dating back to the 1940s, the local administration is entitled to catch and detain all free-ranging animals and to demand a punishment fee from the owner. However, this legislation had not been enforced in the research area. The interviews held with various stakeholders suggest that this was so because enforcement would require administrative resources and could provoke conflicts between administrative officers and the socially powerful livestock keepers.

In 1994, the crop farmers used the opportunity to launch their complaints about the crop damage problem during the extensive election campaigns held for the elections of the Provincial Council, the Parliament and the President. After a left-wing party coalition won the elections at all three levels, the District Development Committee, which is chaired by a locally elected Member of Parliament (MP), decided to attend to the problem. In 1995, the Committee invited the stakeholders concerned to a large public meeting. The participants included representatives of the livestock farmers' organizations, the paddy farmers' organizations, NGOs, development projects and the local administration. The chena farmers did not participate, because they had not formed organizations and, therefore, had no representatives who could claim to speak for them. However, the interests of the chena farmers were expressed by the MP and also by members of the administration. As the conflict was too serious to start a negotiation process right away, a special mediation committee was

nominated. In the following three years the committee developed a solution for the division of the district that was most seriously affected by the problem of crop damage. The committee proposed that the local government should formally allocate a certain area of land as exclusive pasture land to the livestock owners. In return, the livestock keepers' organizations should commit themselves to avoiding any crop damage. After an intensive controversial discussion, the livestock farmers' organizations agreed to this proposal. Upon pressure by the local politicians, the local administration declared that they would enforce the stray animal legislation should the livestock farmers fail to fulfill their commitment to prevent crop damage. Even though the implementation of this agreement was still under process when the empirical research was terminated, the negotiation process represents an interesting case for analysis. What were the incentives of the stakeholders involved? Which strategic interaction took place? What can be learnt from this example for other negotiation processes?

## **4 Analysis of the strategic interaction in the negotiation process**

### **4.1 Political capital as pay-off in an extended form game**

For the analysis of the negotiation process, a simple game theoretical model in extended form is used here (see Figure 1). The two players in the case under consideration are the politicians (P) and the livestock farmers (L). The crop farmers do not appear as players because they were not directly involved in the negotiation process. However, the politicians had to take their interests into account. The outcomes of each terminal node in Figure 1 are given as (*politicians' pay-off / livestock farmers' pay-off*). The pay-off of the politicians is expressed in terms of political capital, while the pay-off of the livestock farmers is expressed as economic capital.

Political capital can be defined as the resources that allow an actor to make or influence political decisions that are in this actor's perceived interests (see Birner and Wittmer, 2002,

for a review of the concept). Interest groups can create political capital in form of electoral leverage or lobbying to influence political decisions. The politicians, who are by law empowered to make political decisions, also need political capital, e.g., in form of a good reputation and voters' support, if they want to be reelected. In the case under consideration, the crop farmers were—due to their comparatively large number—able to create political capital in form of electoral leverage. This type of political capital creation is supported by the electoral system in Sri Lanka. Due to a proportional system of representation and a preferential system of voting, political candidates have a high incentive to care for the interests of their voters (compare Warnapala, 1997). The livestock owners were not able to create political capital in form of electoral leverage due to their small number, but they engaged in lobbying and provided financial resources for election campaigns.

To illustrate the application of the model, we use hypothetical parameter values for the pay-off of the livestock owners and the politicians. The use of empirical values is discussed below, but considered as a task for further research. The factors influencing the pay-off structure in the model are summarized in the lower part of Figure 1.

## 4.2 Structure of the game

According to the model, the politicians have to decide whether or not to start a process of bargaining and offer the allocation of pasture land to the livestock owners (see node 1 in Figure 1.) If this leads to a solution of the damage problem, the politicians will gain political capital, such as votes from the crop farmers in the next election, which is indicated by  $+SS$  in their pay-off. If the politicians engage in high-profile activities, such as bringing the topic on the agenda of the District Development Committee where many stakeholders participate, they will lose face, or reputation, if such activities do not lead to any result. The parameter  $-R$  indicates the loss of political capital arising from such a loss of reputation. This effect, which appeared to play an important role in the local political culture, also creates an incentive for



the politicians to exercise pressure on the administration to enforce the stray animal legislation in case that they have started to search for a solution.

Node 2 in Figure 1 represents the choice of the livestock farmers to accept a proposal of the politicians to receive a certain area of pasture land, if they commit themselves to prevent crop damage. The benefit of the pastureland appears as  $+p$  in the livestock owners' pay-off. However, the land resources in the research area are limited, and the declaration of pasture land will reduce the land available to the chena farmers. This leads to a loss of political support on part of the affected chena farmers, which is indicated by  $-PA$  (loss of political capital) in the politicians' pay-off. The empirical evidence showed that the politicians were not able to offer an area that was large enough to maintain the entire number of animals kept by the livestock farmers. Therefore, even if pasture land is allocated, the livestock farmers will still have to bear costs for preventing crop damage, indicated by  $-c$  in the livestock owner's pay-off. Due to pressure by the politicians, there will be a chance  $p_1$  (node 3) that the administration enforces the stray animal legislation, if the livestock farmers do not agree to a proposal that is acceptable for the politicians. In this case, costs of  $-s$  arise for the livestock owners, which include the fines or the costs of activities necessary to avoid being fined, such as herding.

If the livestock farmers accept a proposal that is feasible for the politicians, they have to decide whether or not to co-operate, which means to fulfill their commitment to prevent crop damage (node 4) in exchange for the allocated pastureland. There is a chance of  $p_2$  (node 5) that the administration enforces the stray animals legislation, if they do not keep their commitment after having accepted the proposal. Similar to a decision tree in risk analysis, the model has to be solved from backwards. It is assumed here that the players are risk-neutral so that the expected pay-off can be used as decision criterion. Otherwise, certainty equivalents would have to be used.

### 4.3 Incentive structure of the livestock owners

#### a) Incentive to co-operate in case of an agreement to the proposal

Suppose that the livestock owners have agreed to the proposal, they have under the following condition an incentive to co-operate, that is to take measures to prevent crop damage:

$$+p - c > (1 - p_2) \cdot p + p_2 \cdot (p - s) \quad \Leftrightarrow p_2 > \frac{c}{s} \quad (1)$$

This implies that the livestock owners only co-operate, if the probability ( $p_2$ ) that the administration enforces the stray animal act is larger than the ratio of the costs ( $c$ ) of keeping the commitment and the costs ( $s$ ) that arise if the stray animal act is enforced. In an empirical application, the costs  $c$  can be estimated by adding the income forgone from a reduced herd size, the reduction of milk yield due to less fodder consumption during night time, and the (opportunity) costs arising due to a longer time per day spent for herding. Based on the data obtained in the survey among the livestock owners, an annual income from a large-scale cattle herd of approximately Rs. 60,000 per year was calculated. Supposed that the costs  $c$  correspond to 5 percent of the annual income (Rs. 3,000), the costs caused to the livestock owners by the implementation of the stray animal legislation (indicated by parameter  $s$ ) would have to be in the range of Rs. 6,000, if the probability of enforcement ( $p_2$ ) is 50 percent.

#### b) Incentive of the livestock owners to agree to the proposal

It is evident that the livestock owners always have an incentive to agree to a proposal, if the pay-off ( $p$ ) of receiving the pasture land is larger than the costs ( $s$ ) arising under the condition that the stray animal legislation is enforced ( $p > s$ ). If  $p < s$ , the incentive of the livestock owners to agree to the proposal depends on the parameter values. In case that the parameter values create an incentive to co-operate, as specified by condition (1), the livestock owners will have an incentive to agree to the proposal if the following condition is also fulfilled:

$$(1 - p_1) \cdot 0 - p_1 \cdot s > p - c \quad \Leftrightarrow -p_1 \cdot s > p - c \quad (2)$$

If the pay-off ( $p - c$ ) has a positive value, the livestock owners always have an incentive to agree to a proposal. If this pay-off has a negative value ( $p < c$ ), the decision of the livestock owners to agree to a proposal depends on  $p_1$ . Rearranging (2) under this condition leads to:

$$p_1 > \frac{c - p}{s} \quad \Leftrightarrow \quad p_1 > \frac{p - c}{-s} \quad (3)$$

As can be derived from expression (3), the livestock owners have only an incentive to co-operate, if the loss they make in case of co-operation ( $p - c$ ) is smaller than the loss ( $-s$ ) they expect, if they reject the proposal and the stray animal legislation is enforced. The more the costs of reducing crop damage  $c$  exceed the benefits from the pasture land  $p$ , the more the politicians have to increase the fine  $s$  or the probability of enforcement  $p_1$  to create an incentive of the livestock owners to accept a proposal. However, the loss of political support by the livestock owners to be expected in this case may limit the possibility of politicians to pursue this strategy.

#### 4.4 Incentive structure of the politicians

In case the parameter values are such that the livestock owners have an incentive to agree to a proposal and to co-operate, the politicians have an incentive to search for a proposal, if the following condition is fulfilled:

$$SS - PA > 0 \quad (4)$$

As one may intuitively suggest, the larger the loss of votes by the chena farmers due to the granting of pasture land, the more likely is it that the case that the politicians do not have an incentive to search for a solution. Two more cases have to be considered in order to analyze the politicians' incentives: (1) the case that the livestock owners reject the proposal and (2) the case that they agree, but do not co-operate and fulfill their commitment. In the first case, the politicians have an incentive to search for a solution under the following condition:

$$p_1 SS + (1 - p_1) - R > 0 \Leftrightarrow p_1 > \frac{R}{R + SS} \quad (5)$$

There are different possibilities to operationalize the concept of political capital in an empirical investigation. If only the electoral leverage counts, the number of voters that are positively or negatively affected by a decision can be used as a measure. To give a numerical example for illustration, let us assume that the gain in votes, if the problem is solved (+SS) is 20,000, and the loss of reputation if the problem remains unsolved after starting an effort to solve it (-R) is - 5,000. According to formula (5), the politicians have an incentive to search for a solution, if they can assure that the probability of enforcement  $p_1$  is higher than 20 percent. It can be derived from Figure 1 that in the second case (livestock owners do not keep their commitment after having accepted the proposal), the politicians have an incentive to search for a proposal, if the following condition is met:

$$p_2 (SS - PA) + (1 - p_2) (-R - PA) > 0 \Leftrightarrow p_2 > \frac{R + PA}{R + SS} \quad (6)$$

Using the same numerical example as above, and assuming that the loss of votes from chena farmers due to the declaration of pasture land (PA) is 7,500 votes, the probability of enforcement in case of non-cooperation by the livestock farmers ( $p_2$ ) needs to be higher than 50 percent in order to create an incentive for the politicians to search for a solution. As voting behavior is also influenced by other factors, one could introduce an ‘elasticity’ measure that indicates the percentage by which the votes from an interest group are reduced if a decision on the crop-livestock conflict is made that negatively affects the interests of this group.

#### 4.5 Potential extensions of the model

Additional insights could be gained from the model, if the interrelation between the pay-off of the livestock owners and that of the politicians is taken into account. The crucial parameter is the size of the pasture land, which increases the incentive for the livestock owners to co-

operate, while reducing the political support from the crop farmers who would also like to use this land. As the livestock owners mainly create political capital by lobbying and financing of election campaigns, different forms of political capital would have to be taken into account in determining the politicians' pay-off matrix. DeJanvry et al. (1992) have proposed to construct a 'political feasibility index' for such a situation. One can draw on this literature to develop an empirical measure that takes different forms of political capital into account. In a further extension of the model, one could also take into account the administrative costs of monitoring in order to determine the optimum relation between monitoring intensity (expressed by  $p_1$  and  $p_2$ ) and the level of punishment (expressed by  $s$ ) endogenously.

## 5 Conclusions

The modeling exercise showed that a simple game theoretical model in extended form can provide useful insights in the incentive structure of resource users and politicians involved in a negotiation process concerning natural resource management. In the case under consideration, the model allows the analyst to calculate the minimum probability of enforcement that the politicians have to ensure in order to create an incentive for the livestock owners to accept a proposal and to avoid crop damage, depending on the costs the livestock owners incur for the reduction of crop damage, the costs arising for them in case of enforcement, and the benefits they receive from the pasture land offered by the politicians. As these parameters can be estimated empirically, the model helps to identify that conditions under which negotiations can lead to a solution of the crop-livestock conflicts. Measuring the pay-off of the politicians in terms of political capital allows the analyst to identify the conditions under which it is rational for the politicians to enter a negotiation process. Thus, the model helps to assess the political feasibility of a negotiation solution, depending on the influence of different interest groups on political decision-making.

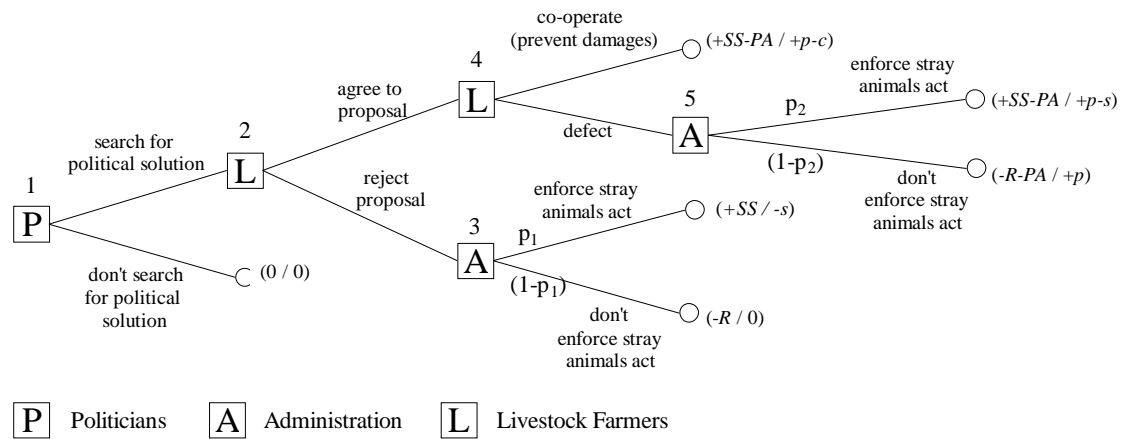
This case study also illustrates that the local bureaucracy can have a decisive function in enforcing the terms of a negotiated solution to natural resource management problems, if purely self-enforcing mechanisms are not available. The devolution of power with the aim to strengthen the liaison between elected politicians and administrative officers, as intended in the institution of the District Development Committee (Warnapala, 1997, pp. 20), is likely to increase the incentive of the local bureaucracy to fulfill this function. In view of an general trend of decentralization and devolution in natural resource management in developing countries, this is an interesting aspect.

This case study also indicates that the opportunities of different interest groups to create political capital and—as a consequence—the incentive structure for negotiation solutions depend on macro-political frame conditions, such as the type of electoral system and the scope for lobbying. Therefore, there is need to analyze negotiation processes concerning natural resource management in a comparative perspective. Studying the experiences in different political, administrative and socio-cultural systems will allow for a better understanding of the conditions under which negotiation approaches can promote efficiency, equity and ecological sustainability in the management of natural resources.

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**Figure 1: Strategic interactions between politicians and livestock farmers**


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#### Pay-off of the politicians (political capital)

- +  $SS$ : gain of political capital in form of support by the chena and paddy farmers, if the problem of crop damage is solved
  - $R$ : loss of political capital, if the politicians start a negotiation process which then, however, does not lead to a solution (loss of face, reputation effect)
  - $PA$  Loss of political capital due to reduced support by those chena farmers who loose land for chena farming due to the declaration of pasture land
- 

#### Pay-off of the livestock farmers (economic capital)

- +  $p$ : benefits from receiving reserved pasture land
  - $c$ : costs involved in avoiding crop damage (reduction of herd sizes, continuous herding)
  - $s$ : costs which arise if the stray animals legislation is enacted ( $s > c$ )
- 

#### Probabilities that the administration enforces the stray animal legislation

- $p_1$  probability in the case that livestock farmers reject proposal of the politicians
  - $p_2$  probability in case that livestock farmers accept proposal but do not keep their commitment to prevent crop damage
- 

Source: author