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# Competition and Cooperation in a dynamical model of natural resources

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**Abstract.** In this paper we propose a model describing the commercial exploitation of a common property renewable resource by a population of agents. Players can cooperate or compete; cooperators maximize the utility of their group while defectors maximize their own profit. The model provides for one utility function which can be used for every kind of player. Agents aren't assumed to be divided into the two groups from the beginning; by solving the static game we obtained the best response function of  $i$ -th player without making other agents positions. Then, the Nash equilibria we calculated point out how different strategies - all players cooperate, all players compete or players can be divided into cooperators and defectors - can coexist. In any case the total harvest depend on renewable resource stock, and it influences agents' positions. According to the Nash equilibria, harvested is arranged to fishing population dynamics and a complete analysis for the equilibria obtained and for their stability is proposed. The effects of the different Nash equilibria on the fish stock are compared showing the more stability in the cooperative case.

**Keywords.** Nash Equilibria, Resource Exploitation, Population Dynamics.