COMMON PROPERTY RESOURCES AND COLLECTIVE ACTION A SHORT REVIEW

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Common Property Resources and Collective Action

A short review

This paper deals with the issue of Common Property Resources (CPR) and the role of Collective Action in sustaining the Commons. CPRs have been misunderstood and often been mistakenly identified with “open access” resources. There have been attempts to privatise them without sufficient understanding of the resource characteristics or the institutional framework for sustenance of the resource. This paper draws on existing literature to demonstrate that a well-functioning CPR would as efficient as a privately owned resource. In order to do so however there is need for collective action. We discuss the factors that are considered crucial in enabling and sustaining collective action. The discussion of CPRs assumes great importance as we struggle to respond to challenges posed by Climate Change and deepening resource extraction.

Key words: Common Property Resources, Collective Action

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1. Introduction

This paper attempts to summarise the issues relating to Common Property Resources and Collective Action. The theory of the "commons" draws on multi-disciplinary contributions ranging from anthropology, economics, politics, sociology to law, and therefore its discourse is varied. Economists find it easier to focus on any issue with a model to give structure to a discussion. The CPR model in economics is well-developed and we present a discursive exposition of the same (and a mathematical exposition of the same due to (Dasgupta 2008) in the Appendix for the interested reader). In the next section we begin with a definition of Common Property Resources as advanced by political philosophers and adapted by other social sciences. This is followed by a discussion on importance of CPRs in people's well-being. We then discuss the conditions under which CPRs can be equally efficient as private property in resource use. Evidently, as these resources we speak about are common, their sustainability is dependent on cooperation and collective action among users. The role of inequality which has been one of the persistent and unresolved issues in the study of the commons is discussed before concluding this paper.

2. What are Common Property Resources (CPRs) ?

The discussion of CPRs should be prefaced by a discussion of what constitutes property because "common" is an adjective describing the noun "property". If we were to substitute "common" by "private", "state" or open (access) to describe "property" we would be referring to the same piece of "property" but indicating different governance regimes.

"Property" has been defined as a bundle of rights which relate to use and transfer of resources (Ciriacy-Wantrup and Bishop 1975, 714). It, therefore, needs to be associated with the idea of entitlements and distinguished from the notion of "ownership". Honore (1961) lists 11 items that form the bundle of rights that define "property":

1. The right to possess– exclusive control. This lies at the core of property.
2. Right to Use
3. Right to Manage

4. Right to Income
5. Right to Capital – Power to alienate, consume or destroy
6. Right to security– Immunity from arbitrary appropriation
7. Right to transfer
8. Absence of Term: Perpetual ownership. Some properties have limited term. Will have lower property right value
9. Prohibition of harmful use: Limitation of no bad externalities.
10. Liability to execution: Full ownership involves the liability of the owner's interest to be used to settle debts.
11. Right to residuary Character: Social rules to govern in situations when the ownership rights lapse for any reason (by war, change of constitution, etc.)

The rules and conventions that govern interaction between economic agents and the resource use are referred to as the "institutions" (Bromley 1989). Property rights constitute institutions as they define the manner in which the rights holder and others interact over the use of a resource.

2.1 De facto & de Jure

A distinction is made between *de facto* and *de jure* property rights. *De facto* signifies the actual exercise of property rights (in practice) by users and *de jure* signifies the legal allocation of property rights. The two groups may coincide or overlap but it is not uncommon for them to be disjoint sets. In the context of sustainability, it may significantly change the outcomes if the *de facto* users are not the *de jure* agents.

In agrarian societies, a resource may be privately owned but either by convention or force of circumstances may be jointly used (by a group). Similarly, forests may *de jure* belong to the state but forest-user groups in local neighbourhoods may have usufruct rights that are *de facto*.[1] Such situations may or may not lead to degradation of the forest. It is unlikely that because resource users only have *de facto* and not *de jure* rights they do not care for the sustenance of the resource. User groups are typically known to protect a resource they have utility for and which is valuable to them irrespective of

[1] In South Asia there is lot of evidence of such arrangements especially in forestry, (see, for example Shyamsundar and Ghate, 2011; Dorji, Webb, and Shivakoti, 2006; Agrawal and Ostrom, 2001).

whether they have *de jure* rights or not (Baland and Platteau 1996; Dietz, Ostrom, and Stern, 2003).

2.2 Distinction between Common Pool and Common property

Very often researchers freely move from one term to the other and since the acronyms of both happen to be CPR they are often synonymously used. However, they are not the same thing. As we have explained earlier, Common *Property* defines an institutional arrangement that confers a set of people with a bundle of rights. Common *Pool* on the other hand refers to a class of resources which cannot be managed as private property – either as sub-divided units because the resource is not divisible or as sole ownership because the cost of ownership is too high. Common Pool Resources are also sometimes characterized as those where it is difficult to monitor the use of a defined group but the extraction of one agent affects (depletes) the share of the others. Examples of common pool resources are underground water or oil aquifers, wildlife, which are difficult to conceptualise as divisible units. On the other hand, the sole ownership rights may be too expensive for some resources, say the earth's atmosphere or migratory birds and fish (Stevenson, 1991). Researchers who have studied institutions, their design and evolution argue that there is no one-to-one relationship between the type of resource and the type of institution. One type of institution that worked well for governance of a particular resource in one part of the world may not work well in another part (Dolšak and Ostrom, 2003).

2.3 Distinction between CPR and Open Access

There has been some misconception about what constitutes CPRs. Early on in this debate CPRs have mistakenly been confused with "open access" (see, for example, (Hardin, 1968). Property that is open access may (a) have no defined group of users (since anyone can access it) and/or (b) lack a set of rules that governs their use. If anyone tried to implement a rule there is no reason why anyone would follow it, since no one can be stopped from its use (Stevenson, 1991). Resources that are "open access" typically end up being over-used and therefore unsustainable. The concern for the survival of the resource triggers the need for initiating a system of governance.

The "property" rights school believes that the best solution lies in the privatization of the resource (Demsetz, 1967; Alchian and Demsetz, 1973). Private owners will have the right incentives to efficiently use the resources as all externalities would be internalized by the individual owners. While private

property lies at one extreme of the possibility set, state ownership lies at the other, where the state by administrative fiat governs the use of the resource. In between sits the common property regime where a group of owners together exercise control over a clearly demarcated resource. Common Property regime may be dictated either by the physical characteristics of a resource or by social circumstances (Stevenson 1991; 4).

3. A Descriptive Model of CPRs

We now present a descriptive model of CPRs in this section. The mathematical exposition of the CPR is due to Dasgupta and Heal (1979) and the one presented in the appendix is taken from Dasgupta (2008). A pasture or a fishery is oft used example of a non-private resource. However, to the advantage of the pasture, it is easily observable and the resource itself is not mobile and therefore easier to monitor and manage by users. Fishery on the other hand, unless it is in an enclosed zone, is more difficult to monitor and manage due to scale and nature of the resource (fish may not remain within a small zone and travel across many fishing areas).

Let us assume that a group of herders use a pasture to graze their cattle. The ownership of the pasture is with the community not with any individual. The community can prohibit the use of the pasture by grazers who do not belong to that village. Since there are access and use rules, a clearly defined set of users as well as resource, this pasture represents a CPR. The herders as rational agents are interested in maximizing their production of milk which depends only on the number of cattle that can access the pasture. For reasons of convenience we assume homogeneity among the cattle – each unit of cattle grazes an equal amount and also produces an equal amount of milk. Since the herders are operating in a larger market for milk, they have no control over the prices and are "price takers".

We will compare two outcomes – one with user rules and implementation and another where either there are no restrictions to entry or extraction – variously termed as "open access" or "Unmanaged CPR" (Dasgupta, 2008, 26) or "Unregulated CPR" (Baland and Platteau, 1996; 2).

Initially when there are very few cattle on the pasture, the profits (total revenue minus cost) will be positive and rising so there is incentive to introduce more cattle. It can be shown that the highest level of profit is achieved when the marginal cost of introducing one more unit of cattle equals the marginal revenue, i.e. the price. Hereafter, there is no incentive for the herder to

introduce more cattle since this would reduce his net revenue from the additional cattle, if there is someway that entry of cattle can now be controlled. This would be an equilibrium outcome with no more or less cattle being brought to the pasture and is akin to a private solution.

3.1 Problems of CPR maintenance

This does not, however, imply that introduction of more cattle would turn the profit into a loss. It merely means profits would decline if more cattle were introduced. If there were no user rules then there is an incentive for herders to introduce more cattle. While this would reduce the net profit to all herders, the profits would still be positive. And this would be an incentive for entry of more cattle till the net profit from introducing more cattle goes to zero. After this there is no incentive to introduce any more cattle. This is also a point of equilibrium where the price equals the average cost of introducing more cattle and is akin to an open access equilibrium.

The CPR outcome could easily replicate either of these solutions but would depend on the degree of regulatory power of the users. In the best situation the CPR could provide the same outcome as a privately held resource by equating their marginal cost with the price. However, if the regulatory mechanism breaks down then it could easily become an "open access" situation where the resource extraction is sub-optimal.

The fear of such degradation leads people to propose "privatization" of CPRs. However, those who propose privatisation assume away numerous institutional issues the cost of which may be non-trivial. (Seabright, 1993) pointed out that in order for privatization to attain the full efficiency gains all contracts have to be complete. Privatization reduces mutual social interdependence that creates cooperation since agents now behave as atomistic agents (Ostrom, 1990). Further with property becoming tradable, agents may feel less inclined to invest time in long-term cooperative behaviour, which could also reduce cooperation (Grossman, 2001).

The CPR solution is not necessarily any easier. To maintain a CPR at the very least there is need for access rules and a well-defined group of users. The users should be able to enforce the rules of use failing which the CPR may become open access. The enforcement of rules needs cooperation or collective action. The cost of creating cooperation or undertaking collective action can be substantial and is referred to as Transaction costs in institutional economics (Dolšak and Ostrom, 2003). Sometimes this cost can be large and beyond the

reach of users to undertake (Olson, 1971). Similarly, the users may themselves over time change and their reliance on the resource may decline. However, if users are able to undertake collective action, then they are able to reduce transaction costs. In fact, lower transaction costs are associated with high social capital, cooperation and collective action (Ostrom, 1990).

4. Collective Action

Collective Action (CA) does not have a universal definition and there are disagreements on (a) what kind of action constitutes CA, (b) what are the goals of CA, and (c) what is "collective" about CA. While some have defined CA as the effort to produce collective goods, they limit actions to those performed in public but exclude the routine ones that have state or political party initiation or backing. Others have even argued that CA does not have to be an action at all, but just a shared common objective or goal that provide for a collective good (see Burstein (2009) for a discussion).

There is a perception that an action becomes collective only when it involves more than one person. But this misses the individual actions undertaken towards securing a collective good or end. The Indian legal system recognizes this and therefore allows citizens, individually or collectively to pursue litigation in public interest – a collective goal. In a more benevolent situation this is also called the "grand-fathering" where one person takes on the liability of effort on behalf of a group in an altruistic fashion. While these acts are not unknown they are uncommon. For our purposes we will define collective action as any effort aimed at producing a collective good. When researchers refer to the problem of commons (or collective action), what they really want to do is to solve the problem of "free-riding".

Olson (1971) believed that CA was not viable in the long run and individual rational behavior would provide the incentive to cheat ("free-ride") which would lead to a breakdown of CA. If at all possible it would work only in small groups. It has been convincingly argued that Olson was being rather pessimistic about CA and history of local institutions and natural resource management shows that agents and groups do not necessarily display myopic behaviour on most occasions.

4.1 Factors enabling Collective Action

Systematic studies have been done to understand the institutional or resource characteristics of well-managed resources by communities. Certain common

institutional features have emerged in the empirical literature as being important in enabling and sustaining CA. Agrawal (2001) shortlisted conditions under four broad themes – resource characteristics, group characteristics, institutional arrangements and external environment. He further listed the relations between these themes that were deemed necessary as "facilitating" conditions or as "critical enabling" conditions for successful collective action.

The resource characteristics suggested are:

1. small size (of the resource),
2. well-defined boundaries,
3. low mobility,
4. storage possibilities, and
5. predictability

In the group characteristics, he lists the following:

1. small size;
2. clearly defined boundaries;
3. shared norms;
4. past successful experiences–social capital;
5. appropriate leadership—young, familiar with changing external environments, and connected to local traditional elite;
6. interdependence among group members;
7. heterogeneity of endowments, homogeneity of identities and interests; and low levels of poverty.

He then goes on to state the interaction conditions for resource and group characteristics:

1. Overlap in user group residential location & resource location,
2. High dependence by group members on the resource system,
3. Fairness in allocation of benefits from common resources,
4. low levels of user demand, and
5. gradual change in levels of demand.

Institutional arrangements on the other hand require:

1. Simple rules,
2. Locally devised access and management rules, ease in enforcement of rules,
3. Graduated sanctions,

4. The availability of low-cost adjudication, and the accountability of monitors and other officials to users

External Environment is expected to have:

1. Low-cost exclusion mechanism,
2. Local authority not undermined by higher authority,
3. Supportive external sanctioning institutions,
4. External aid to compensate local users for conservation activities, and
5. Nested levels of appropriation, provision, enforcement, and governance.

The multiplicity of conditions proposed above constitutes a large wish list and Sethi and Somanathan (2006) argue that a number of them are endogenous and therefore do not qualify as pre-requisite enabling conditions. For example, the list includes shared norms and past successful experiences. But these are a consequence of successful collective action in the past, so cannot be prerequisites. Presence of social capital and successful collective action in another domain also presumes prior collective action as does the defining of a group of users and managers.

The role of group size has been much discussed in the literature. Olson (1971) believed that smaller the group size, the more likely is collective action to succeed as chances of free-riding would be less. The cost of communication is smaller in small groups and social sanction can be an effective deterrent. In larger groups imposing sanctions can be difficult and expensive. However, the flip side of this is that it may bring in social friction if punishment was imposed in a small group and it led to fragmentation of the group. This is even more worrisome if there is inter-dependence within members of the group as it may wither away the cohesiveness of the group.

Among the institutional arrangements that Agrawal (2001) lists, all the enabling conditions are endogenously determined except the last one. The second condition of local authority not being undermined by higher authority could be dependent on the local group's lobbying powers. Higher authorities typically do not interfere with strong local groups and are wary of changing rules fearing public outcry if there is an active civil society. So the autonomy of local institutions could be endogenous and an outcome of prior collective action. The same argument holds true for the third condition which is: "Supportive external institutions". In democratic multi-layered systems with devolution of powers, existence of *quid pro quo* links between higher and

lower levels of institutions is not uncommon. Support from higher levels is forthcoming when there are strong groups at grassroots level. But that already presumes presence of collective action and therefore cannot be an enabling factor.

Sethi and Somanathan (2006) conceive of a situation where the collective action is for provision of a public good and for punishing those who do not fulfill their obligation. Sethi and Somanathan (2006) suggest that this will work only if (a) the prospect of being punished is high enough to act as a deterrent, (b) the cost of imposing the punishment is low, and (c) the cost of creating (and sustaining) cooperation are lower than the benefits of collective action.

The success of collective action in using common property could effectively hinge on the presence of just a few things:

1. a mechanism that keeps gains from regulation to be sufficiently larger that unregulated exploitation,
2. low transaction costs of institutional operation, and
3. low cost (of imposing) a deterrent punishment for violators.

We next examine the role CPRs play in livelihood support, which has been one of the prime drivers of collective action to sustainably use the resource.

5 CPRs and Livelihood Dependence

In developing countries, CPRs play an important role of livelihood support. While there are no reliable global assessments of dependence on CPRs across all resources for livelihood, there have been numerous studies either for specific regions or resources, especially in the developing countries. Jodha (1986) was one of the earliest to highlight the critical role of CPRs. There have been numerous attempts thereafter to estimate the extent of reliance on CPRs especially in India but most of these have been micro-level studies (see for example Chopra, Kadekodi, and Murty, 1990; Kadekodi, 2004; Ghate, Jodha, and Mukhopadhyay, 2008)[2].

[2]For a list of journal articles on CPRs of India the interested reader may see http://coe.mse.ac.in/journalarticlesview.asp?k=Common%20Property%20Resources. A bibliography on CPRs is also available for ready reference at http://www.sandeeonline.org

Two significant attempts have been made to facilitate large scale analysis, which deserve mention. First, the International Forestry Resources and Institutions (IFRI) which has been collecting data from 1992 for 250 user groups in 15 countries. While the data set is large and comparable in the sense that they use the same protocol, the data collection is intermittent. However, this dataset is very rich and has resulted in numerous publications.[3] For Indian readers, it would be of interest to know that of the 13 CRCs that IFRI has identified across the world, one is located in SHODH, Nagpur, India.[4]

The second dataset, and probably the only systematic survey available at the national level on CPRs in the developing world is from India. The National Sample Survey Organisation assessed the role and status of CPRs in India (NSSO, 1999). To estimate the land coverage by CPRs they used the *de jure* definition and for estimating dependence they used the *de facto* definition. *De jure*, CPR's cover as much as 15% of the total land surface in India, while *de facto* about 48% of households reported dependence on CPRs (Chopra and Dasgupta, 2002; 9). Degree of dependence on CPRs differs across regions. Western Himalayas out of the 15 agro-climatic zones, showed the largest collection of forest resources followed by Eastern Himalyan region and the Upper Gangetic Plains (Menon and Vadivelu, 2006).

If one were to look at the spectrum of CPRs that have been studied worldwide or in India, forestry by far has the largest number of contributions (Chopra and Gulati, 2001) and most have a rural focus. Forest ecosystems have been seen as a supplementary source of incomes as well as a safety net during extreme events or crop failure (Pattanayak and Sills, 2001). In some cases, incomes from CPRs are recorded as being even higher than from agriculture.

[3] Please see the IFRI site http://sitemaker.umich.edu/ifri/home (accessed March 25, 2012) or the Digital Library of the Commons for a listing of some of the IFRI data based studies (see http://sitemaker.umich.edu/ifri/pblications and http://dlc.dlb.indiana.edu/dlc).

[4] See http://sitemaker.umich.edu/ifri/directory_filter&mode=list&column0=CRC&sortColumn0=sortorder&comparisonType0=is+equal+to&value0=India&sortDirection0=Ascending (accessed May 29, 2012).

6 Inequality and the Commons

The role of distribution (Inequality or Heterogeneity are terms synonymously used) has been central to the discussion on the Commons (Baland, Bardhan, & Bowles, 2007). Olson (1971) felt that greater inequality is good for conservation. The presence of a few wealthy people in the local community would ensure better maintenance as they would undertake it with low transaction costs for collective action as long as the gains from conservation are sufficiently larger than the cost of creating or protecting resources.

There is counter evidence to suggest that greater the equality, more the chances of cooperation and more sustainable the resource outcome (Dayton-Johnson and Bardhan, 2002). In between these two positions there have been more nuanced responses depending on local contexts and nature of heterogeneity – income or wealth, social or ethnic, preferences (see, for example Adhikari and Lovett, 2006; Naidu, 2009; Ruttan, 2008).

7 Future of the Commons

CPR as a theme of study gained interest soon after Hardin's 1968 paper but it gathered momentum with the formation of Common Property Network in 1984 followed two years later in 1986 by the publication of the Common Property Digest. Three years later (in 1989) a multi-disciplinary group formed the International Association for the Study of Common Property (IASCP). It started a new journal called the *International Journal of the Commons* from 2007. This Association has been instrumental in nurturing research on the Commons.[5]

We end this paper with a shortlist of some of the under-studied and emerging areas in CPR and collective action research. A large part of the developing country population as well as poverty is now "urban", however research on urban "commons" remains an under-studied area. While there have been numerous contributions on urban recreational benefits and pollution, issues of urban livelihood support are few (Twyman and Slater, 2005). Yet those of us who live in South Asia do know that the poor still rely partly on dry wood and "head-loading" from urban CPRs for their energy needs.

[5] See http://www.iasc-commons.org for further details.

Fisheries as a CPR has been widely researched in developed countries but less so in South Asia and therefore remains an area of interest (Gunawardana and Steele, 2008). While experiments to study collective action in laboratories has been done for sometime now, this is relatively new, as are field experiments, in developing countries (Bandiera, Barankay, and Rasul, 2005; Cardenas, Rodriguez, and Johnson, 2010; Ghate, Ghate, and Ostrom, 2011). Finally, Digital Commons, Genetic Commons, Patents, Music, Literature, intellectual property, are the newer forms of common property that offer the researcher new avenues to work on. With the challenge of climate change and the need for a global institutional structure to curb atmospheric accumulation of carbon and CFCs, the study of the commons will continue to be of importance.

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Appendix: The CPR model: A Mathematical Exposition (Dasgupta 2008)[6]

The model assumes that there are "N" herdsmen who individually own cattle. Let the size of the village herd be "X" of similar (homogenous) cattle. Using a constant returns to scale production function[7] we can state that the amount of milk produced:

1. $Q=H(X, S)$.

This can be re-stated in reduced form as

2. $Q=F(X)$, since S is fixed and H is constant returns to scale.

It follows that the following well known properties are applicable

3. $Q_0=F(0) = 0$; $F'(X) > 0$; $F''(X) < 0$; and $F(X)/X > F'(X) > 0$ for all $X \geq 0$.

Since the herders are price-takers for milk, it does enter as a decision variable and we can normalise its price to be one. However, we can assume that herders hire the cattle at a fixed rental price "p". The objective of this exercise is to find the profit maximizing configuration for the herder.

Let x_i be the size (number of cattle) of the 'i'th herder. The output of each herder 'i' can then be state as $x_iF(X)/X$ and the net profit, π_i, (revenue minus cost, assuming that hiring of the cattle is the only cost incurred) is:

1. $\pi_i = x_iF(X)/X - px_i$.

If we assume that all herders are similar and therefore own the same size of cattle 'x', then total cattle size $X = N.x$. The profit equation for the i^{th} herder (4) can be re-stated as

2. $\pi_i(x_i, x) = x_iF(x_i+(N-1)x)/(x_i+(N-1)x) - px_i$,

The interesting aspect of the above equation is that it establishes the impact of others' action on herder "i's" profit.

Let $\underline{x}$ be that value of x_i which maximizes the i^{th} herders profit - $\pi_i(x_i, \underline{x})$. In order to find a maximisation solution, we differentiate the profit function $\pi_i(x_i,$

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[6] This section borrows generously from Dasgupta (2008).

[7] It is also assumed that $H(0, S) = 0$ for all $S \geq 0$, and $\delta H/\delta X$, $\delta H/\delta S > 0$ and $\delta^2H/\delta X^2$, $\delta^2H/\delta S^2 < 0$.

$\underline{x}$) partially with respect to x_i. The first order condition requires us to equate the result to zero such that

3. $F(x_i+(N-1)\underline{x})/[x_i+(N-1)\underline{x}] + x_iF'(x_i+(N-1)\underline{x})/[x_i+(N-1)\underline{x}] - x_iF(x_i+(N-1)\underline{x})/[x_i+(N-1)\underline{x}]^2 = p$

Since x_i is the best response to $\underline{x}$ and all herders are alike, x_i will equal $\underline{x}$. Therefore, on rearranging the terms we find that

4. $((N-1)/N)F(\underline{X})/\underline{X} + F'(\underline{X})/N = p,$ where $\underline{X} = N\underline{x}$.

The CPR solution $\underline{X}$ lies between the private optimum point where $F'(X)= p$ and open access equilibrium where $F(X)/X = p$.

Incidentally, as $N\rightarrow\infty$, all rents will be dissipated and average output will equal price, an open access situation and equation (7) would reduce to:

1. $F(\underline{X})/\underline{X} \approx p$

If the entire grazing land was privately owned by one individual or the herders managed to cooperate costlessly, then they would maximise aggregate profit $(F(X) - pX)$. The first order condition is the expected condition

2. $F'(X) = p.$

Let X^* and π^* denote the optimal cattle size and optimal profits, and so $\pi^* > \pi$ at any other X. The anticipation of this result has prompted the "property" rights school to resolve issues in sustainability by privatizing a resource. Even if there were multiple owners with private rights, say the grazing land was privatized in to N equal portions, the optimization would give us the same result as above with $F'(Nx) = p$, and $Nx=X$.

Equation (9) is therefore an optimal solution that is possible both under private property regime as well as under CPR. Both solutions would require the presence of trust and credibility in the institutions that support these regimes (see Dasgupta 2008 section 6 for a detailed discussion).

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