

Draft, for comments only

REAPPRAISING
COMMON PROPERTY INSTITUTIONS

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I

GENERAL CHARACTERISTICS OF INSTITUTIONS

"Common pool resources", "common property regimes", "collective actions" - the propriety of such terms have already been established. Not so clear is the concept of institutions and organisations with respect to CPR. Current developments demand that this distinction be made thoroughly. For quite some time several concepts of "institutions" were in use. To the property rights theorists institutions were synonymous to implicit and invisible rules. While analyzing the visible firms Williamson understood institutions as governance structures. North and Thomas (1973) had admitted both types of understandings, by differentiating "institutional environment" from "institutional arrangement". In his recent book however, North (1990) changed the terms calling only the former "institutions" and the latter, "organisations". His definition of institutions includes rules, norms of behaviour and the way they are enforced. Organisations are firms, trade unions, political bodies. IASCP¹ seems to have been subscribing to this terminology. Scopes of confusion however, are still there. For example, Elinor Ostrom named her book "Governing the Commons" - resembling Williamsons' typology. It was followed by a subtitle "Institutions for Collective Action". Does it mean that proper terms will be "common property (pool) organisation" and "institution of collectives" ?

As for the definition of institutions, Ostrom does not merely use the same one as North, but defines it more rigorously. Institutions are defined (1990 : 51) as "the sets of *working* rules those actually used, monitored and enforced Working rules are common knowledge". Following this definition Ostrom's design principles together describes CPR-institutions. CPR organizations however, will need to be expressed in terms of 'irrigation associations', 'fishermen community' etc. Some of them may be so embedded in other forms of organisations that they will not have a distinct local name.

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Developments in the theory of institutions have brought out the relations between the two. Institutions are "frameworks within which human interaction takes place". Organizations are "groups of individuals bound by some common purpose to achieve objectives". The distinction need to be made at the conceptual level though it may be difficult to follow that in all circumstances. Both institutions and organisations provide a structure to human interaction. The kind of organizations which come into existence and the way they develop are fundamentally influenced by the institutional framework. In turn they influence how the institutional framework evolves (North, 1990 : 4-5).

An institutional model of commons must have both *general* features of institutions and *specific* features of common pool resources. These need to be separately identified.

The formal institutional model of CPR that is gaining currency is best presented by Ostrom, in her *GOVERNING THE COMMONS*. She sets the role of institutions as reduction of uncertainty and develops the theory of cooperation beginning with individuals. The situational and behavioural assumptions are of imperfect information and bounded rationality, and the analytical method is that of transaction cost. While these are in agreement with new institutionalist theories, there are three notable differences which deserve mention :

(i) She includes in her list all kinds of situational uncertainty² while North isolates only *uncertainty in the area of human interaction* as essential ingredient for understanding institutions. Although implicit in her study, Ostrom did not isolate this particular kind of uncertainty. Uncertainties in the area of physical and technical attributes may be met individually and are not an essential ingredient of institutions. Only if the solution requires cooperation of several individuals it becomes a matter of concern for institutional study.

(ii) Notable addition in her behavioural assumption is *description of individuals as contingent strategists*. She explains - because CPR settings extend over time -- it is possible for individuals to utilize contingent strategies, not simply independent strategies, in relating to one another. However, neither the repeated situation nor the contingent kind of strategy is specific to CPR institutions. Both are implicit in North's model of institution. Although North expressed reservations³ about repeated games modelling of real situations, it is implicit in his analysis. One must note that the very domain of norms, conventions and rules have to be repeated situations. It is true that in real sense, every situation is different. In rule following however, individuals classify problems which are in some way similar (Vanberg, 1993 : 175).

Bounded rationality necessitates making distinction between objective and subjective, reality and perception. The *perceived structures*⁴ of all situations, on which an individual responds in the same manner (following a specific conventions), are indeed, as crudely repetitive as game theorists present. It may not be merely a matter of incomplete deciphering of the environment (North, 1990 : 20-24). Individuals may act consciously as

reductionists and translate different perceptions of real situations in their essential structures and similarities, in order to apply conventions. As we will find later, this has significant contribution on the evolution of CPR institutions.

Similarly, contingent strategy too is implied in North's rational choice model though the term is different. Strategy is a term specific to game theoretic approach. North mentioned adaptive learning, particularly in his chapters of institutional change.

(iii) Individuals discount future benefits - how severely depends on many features, is another basic behavioural postulate of Ostrom. This condition does not need specific mention for studies of institution formation though is useful for sustainability analysis⁵.

Indeed, discounting of future returns have been unduly stressed in institutional literature. One should note that this feature gets included more often for mathematical comprehension, since infinite series aggregates cannot be (easily⁶) compared otherwise. But this condition does not deserve any special mention in the general framework of institutions, e.g. North. In this connection it should also be noted that some other features like infinite repetition and lack of end game, too have been overstressed largely owing to the mathematical convenience. In order to avoid the undesirable result of backward induction Nash solution, infinite recurrence is an oft-repeated condition for cooperation. There are other conditions which help escape this mathematical complexity - following Shubik, I had noted a few (Sengupta, 1991 : 258) :

- (i) There is a probability at every stage that the game may terminate, though such termination is never a certainty
- (ii) The game may have infinite horizon but has an end value
- (iii) The strategists optimise the average return per period, not the aggregate return over time.

The first one was used by Axelrod in his tournament. The next one implies that an increase in rental return is enough. The last one is also a likely candidate for describing behaviours of real decision makers. Over-zealousness with mathematical game theory has not helped further investigation into these alternatives.

Also, Petit and Sugden (1989) argues against the universal use of backward induction strategy and indicates that players may as well take into account how the game historically unfolds. Hence, one doubts if these conditions are essential.

As against that, the institutional theories will benefit by encouraging the discussion of its links with another branch of mathematical theories, called *synergetics* as a group. The major departure that has been made by

new institutional theories over the neoclassical economic theory is in the area of aggregation. The new institutionalists have come to accept that "the whole is greater than the sum of the parts". This concept has been in existence for long in biology, ecology, chemistry, cybernetics and management. Acknowledging the common link through synergy effect will further the new institutionalist goal of breaking the disciplinary barriers. But more than that, this may open up a lot of very profitable exchange with some other branches of modern mathematics⁸. Recently considerable advances have been made through the studies of non-linear systems, self-organisation, phase transition etc. in establishing the links between individual components (statistical mechanics) and dynamic systems.

II

SPECIFIC FEATURES OF CPR INSTITUTIONS

Let us now turn to the characterisation of institutions specific to CPR. Oakerson (1992) had earlier produced a general framework for heuristic purpose. Of the four attributes enlisted - **physical and technical, decision making arrangement, pattern of interaction and outcomes**⁹, the second one, consisting of rules and organizations, describe the institutional system. The other three attributes help place this (sub)system within the holistic concept of CPR system. Thus, one need to refer, from time to time, to physical and technical attributes, patterns of interaction, the assessment of outcomes, even the overall society and the environment while characterising CPR institutions. But these are better described as *external links*, the internal structures of the institutions should be the focus of inquiry.

What are the characteristics of CPR institutions in general? Analyzing the rules followed in several long-enduring, self-organized, self-governing CPRs Ostrom identified (tentatively) several patterns - termed "design principles" - universally found in them. These are therefore, the currently available general characteristics of CPR institutions. The appeal of this exercise however, is somewhat more general. The identified design principles are specific to CPRs. But they pertain to rules which belong to different social spheres. Thus, Ostrom's approach has relevance for all different types of institutions. If the relevant social spheres are identified properly and exhaustively, then the same approach can be used to obtain "design principles" for institutions other than CPR too. On the other hand, by checking *whether all relevant social spheres have been taken into account*, the tentative nature of Ostrom's list can be partially overcome. With these comments, let us study her list of principles.

The first design principle : **clearly defined boundaries** refers to property rights. This is the first feature analyzed in new institutional studies. In case of CPR this attribute draws line of difference with open-

access resources and creates the basic conditions on which rules and regulations in use can be developed.

The second principle : **congruence between appropriation and provision rules**, later termed **proportional equivalence between benefits and cost** in her book *Crafting Institutions* , actually includes the basic features which generate the cost-benefit structures for each element in the opportunity set on which rational choice acts. For the clarity of understanding, I feel, the natural, technical, social and organizational details, which describe the production and distribution under the different opportunities, should remain external to the institutional rules; their cost-benefit implication alone should be included here. This principle is better stated as :

The physical, technical and environmental situation is one in which, if they adopt co-ordinated strategies, appropriators obtain **higher joint benefits or reduce their joint harm** than if they act independently²⁰.

No doubt, it is also important to enlist the wide varieties of conditions that give rise to the specific kind of opportunity frontier. But they should be included in "physical and technical attributes" and only a reference to this connection will be legitimate entry in institutional studies.

The third principle is about the **arrangement for making operational rules**. In case of CPR it takes the shape of collective choice arrangements. In case of individual entrepreneurship the power rests with the entrepreneur.

The fourth and fifth principles pertain to the area of **monitoring and sanctions**. These are again general features. The CPR institutions have specific characteristic - mutual monitoring and graduated sanction. Other kind of institutions must have different design principles.

The sixth and seventh principles are not even specific to CPR. They talk of conducive external support to the monitoring and sanction rules :

6. Conflict-resolution mechanisms in other arena

7. Minimal recognition of rights to organise.

The last principle is about the nature of **integration between different units within an institution**. In case of CPR it takes the shape of nested enterprises. Its counterpart in the analysis of firms is internal (vertical and horizontal) integration as well as network analysis.

I feel the list is quite exhaustive and all the relevant social spheres have been taken into account. But thorough scrutiny for sufficiency by others too, will be desirable.

In studies of institutional frameworks all the researchers are aware that there is a hierarchy of institutions, or "multiple levels" (as per

Ostrom) extending from operational to constitutional spheres. Much less awareness is shown about the hierarchic disaggregation of attributes and rules. The attributes and rules as above are very high level abstractions (reduction of perceptions of concrete). Physical and technical attributes consist of many heads, many parameters, many levels. Costs pertain to each head and each level under a single unit of CPR. Monitoring is necessary at each point. Benefits are sometimes several items, sometimes a package of multiple attributes²¹. Kinds of sanctions, arenas of conflict resolutions, recognition of rights to organise, all disaggregate into greater details. While Oakerson's framework is a very high level abstraction, Ostrom's design principles are partial concretisation of the attribute "decision making arrangement". In an inquiry of institutions this attribute of CPR is central. We will restrict our discussions to the level of abstraction used by Ostrom, as noted above.

III

IMPLICATIONS OF CONTINGENT STRATEGY

The crucial improvement made by Ostrom in the new institutionalist models is the specification of contingent strategy²² in the behavioural formulations. This makes her subscribe to the adaptive learning framework in the rational choice modelling²³. Learning is a process, and this specification immediately permits her to develop a process analysis. Further, it differentiates the evolutionary process of institutions from the biological process of natural selection through the introduction of conscious choice in evolution²⁴. There is nothing in the model to show that the selection process will necessarily lead to the adoption of the most efficient outcome, which is in accordance with new-institutionalist position (e.g. North)

Contingent strategy as behavioural assumption agrees well with rational choice theory but not when conventions and norms guide choice. However this is a problem of all neo-institutional theories - one cannot know when an individual is a calculating rational and when he is ceasing to be so. By admitting norms and conventions in economic theorization the unambiguous behavioural explanation of neo-classical era has been lost. Efforts for a suitable substitute are being made²⁵. It is worth noting that contingent strategy along with bounded rationality provides the best alternative formulation for a unified theory. In perception under bounded rationality objective reality is filtered through reductionism which may miss finer points of distinction. If the perception agrees to certain patterns, conventions may be evoked, if it does not, decisions are made by weighing different alternatives carefully. Thus, the same contingent strategy may result either in conventional or maximizing response, both as rational choice on *perceived* situations.

The most important feature for the current analysis is that the

postulate integrates monitoring into the basic assumptions. Note that a contingent strategy presupposes a feedback in information about previous outcome(s). This can be obtained only through monitoring¹⁶. In other words, if contingent strategy describes the behaviour of individuals then implicitly, they are also constantly monitoring the environment around them. How *efficiently* can they monitor is a different question. If information with some accuracy is not available, then contingent strategy cannot be used efficiently. This is implicit in Ostrom's model. If the cost of generating necessary information is high organizing effort fails. Arrow had indicated long ago (1974 : 37), "the desirability of creating organizations of a scope more limited than the market as a whole, is partially determined by the characteristics of information flow".

IV

AN APPROACH TO PROCESS ANALYSIS

" At the most general level, the problem facing CPR appropriators is one of organizing : how to change the situation from one in which appropriators act independently to one in which they adopt co-ordinated strategies to obtain higher joint benefits or reduce their joint harm."

Faced with this problem both mainstream game theory and standard economic analysis will unfold into finding whether the "higher joint benefit" situation is an equilibrium solution, if it is, whether the equilibrium is a rational choice and so on. Ostrom (1990) evades this dead end of theorizing by simply stating :

"Because of the *repeated situations* involved in most organized processes individuals can use *contingent strategies* in which cooperation will have a *greater chance* of evolving and surviving" (p. 39).

She does not provide any deduction in the manner of equilibrium analysis. To the best of my knowledge, there is nothing in game theory literature that contradicts the guarded statement rejecting only the *definitiveness* of the "tragedy of the commons". No doubt, a stock taking of the currently available results pertaining to the statement will be desirable. Enlisting of the necessary and sufficient conditions, if they exist, will help reduction of the indeterministic element in the predicted evolutionary process. This however, is not to be expected from Ostrom here, for her research agenda is different and, a daring venture into an extremely important but neglected area.

Traditional equilibrium analysis engages in identification of the stable state at the expense of the *process*¹⁷ which are meant to have produced

this condition. Institutional analysis, in this tradition, is directed towards finding of functional explanation, as if some other mechanism - termed "invisible hand" by Adam Smith - will take care of its evolution and any other realisation process²⁸. Warnings have been issued from time to time, against this tendency and recently some works have made some significant contribution (e.g. Schotter, Sugden, Axelrod). Ostrom sets a complete research programme for formal analysis of a process. Her research agenda is (pp. 39-40) :

Making the switch from independent to coordinated or collective action is a nontrivial problem. This must take into account :

- (1) the problem of supplying a new set of institutions ,
- (2) the problem of making credible commitments and
- (3) the problem of mutual monitoring.

She also noted that these three -- problem of supply, credible commitment and monitoring -- are the necessary considerations for a general theory of institution formation process, including that of firms or states. For the time, let us follow her analysis of CPR alone.

A dynamic process is described only in terms of an initial and a final condition. Thus, we will have to refer to her ideal institutional features - the design principle identified from long enduring, self-organized, self-governed CPRs - as the reference to final state. The obvious choice for initial is a status quo situation - the existing institutional set up. She establishes that the ideal design principles also help solving the three problems of switching listed above.

V

ON ADEQUATE MONITORING

Let us first address the problem of monitoring. As stated already, monitoring of some sort is always associated with contingent strategy. But the switching condition requires monitoring of sufficient quality - that help evolution and stability of the jointly beneficial alternative. The first three design principles provide the most congenial condition for attaining that, though they do not guarantee its occurrence in all circumstances.

The first principle concerning property rights, demarcates the beneficiaries and internalises the externalities to individual beneficiaries. The second design principle about the opportunity frontier establishes the existence of such an alternative. It is the third

principle : collective choice arrangements, which deserves greater attention. She uses this to indicate that under rules admitting this principle monitoring cost need not be substantial. Costs and benefits of monitoring a set of rules are not independent of the particular set of rules adopted. Some rules are easy to monitor within the existing local set up, some others are difficult. When appropriators can design some of their rules, they can make⁴⁹ rules which are cost-effective in implementation under the local conditions. If such cost-effective-in-monitoring rules cannot be devised CPR institution will not be formed. The problem of devising these rules will be discussed in the next section, along with other supply problems.

Let us complete the discussion by indicating the kind of support structures necessary for any locally developed rule to be honoured. If monitoring of the required degree is feasible it should be followed up by sanctions, and necessary resolution procedure in case of a conflict. Also, the local works should receive external support, including from the government. Thus the other design principles :

5. (Graduated) sanctions
6. Conflict-resolution mechanisms in other arena
7. Minimal recognition of rights to organise

complement the monitoring mechanism.

VI

MEETING SUPPLY DILEMMA

We will now look into the problem of supplying a new set of institution. It involves investment in collection of information on natural and technological aspects, designing, cost estimation, negotiation etc. In case of private enterprise the entrepreneur supplies those in anticipation of the sizable benefit he will get. In the case of CPR the additional benefit is shared by many and thus, no one may be left with sufficient margin to meet the initial investment requirement, if it is high. But even if the cost-benefit calculation is not prohibitive, why should one invest in supplying something on ones own, being aware that any benefit may arise only if others comply voluntarily to the requirements of the project? Bates call it a *second order dilemma* to be faced even after equilibrium conditions favour the jointly beneficial alternative.

Ostrom solves this problem by suggesting that all investment processes in CPR are *sequential* and *incremental* (p. 141). This is not very appealing and comes close to universalising the transformation process to those where cost-benefit calculation does not prohibit individual initiative. I feel there is a much better scope of explanation elsewhere in her study.

She goes to identify her focus of inquiry (183-4) as the "behaviour of appropriators in the smaller-scale CPRs : In such situations, individuals repeatedly communicate and interact with one another in a localized physical setting." This is a setting where communication is practically costless. Investment in the planning process will be much easier in such a setting.

In my writings I did consider this neighbourhood characteristic as an extremely important feature of all CPR and had included each case details under the title "information circulation". In some cases the place and pattern of habitation of families dependent on CPR were found to be dictated by this feature. In one case, there were absentee petty landlords - but they were required to engage resident representatives. Indeed, the institution of settlement - the residential pattern, meetings grounds and social gatherings - is the most important *social capital* which helps investment in CPR institutions. Coleman (1993) too considered this aspect, which he calls "connectedness", as a crucial feature in institutional studies.

In a setting where communication between the potential co-sharers is practically costless, the incentive question in supply is not a problem. Financial and technical constraints remain, and we will consider those in section IX. But motivation does not lack. Let us trace the steps involved in such a process :

(i). The process starts, when, on a fine morning, someone from the potential beneficiaries somehow conceives the possibility of a more promising avenue. This may be an *innovation*, or an *emulation* of some experience at some other place visited in connection with some other purpose. Alternatively, an *extension* agency like the government, may be willing to introduce the alternative ; its incentive problem remains out of the purview of our discussion. Our concern, in this case, is the first (few) adopters of the idea. This *initiator* (innovator/emulator/adopter) is the counterpart of entrepreneur in CPR situation. The second order dilemma occurs with respect to his initiatives.

(ii). The initiator perceives that there is greater benefit in the alternative. But the others are still ignorant. No doubt they are contingent strategists and are constantly assessing their environment. But their rationality is also bounded, and in the *perceived opportunity frontier* to them either the alternative does not exist as yet, or its benefit cost picture is hazy.

(iii). The initiator himself hopes to benefit - from the materialisation of the alternative -if others co-operate. He has access to the *costless* communication channel to propagate the knowledge. This is reflected in rounds and rounds of discussion in which the available physical, technical and environmental information are discussed,

designs for appropriation, monitoring and sanctions are introduced and modified, allocation methods are assessed by every individual from self-interest angle, monitoring and enforcement possibilities are scrutinised. Gradually the alternative possibilities unfold to everyone whereupon those constitute parts of their perceived opportunity frontiers²⁰. Anyone familiar with a village life will notice that these are the kinds of discussions which are often conducted in informal assemblies like tea shops or liquor joints. There is no motivational reason that would restrict such designs to sequential and incremental investments²¹. If enough resources are available beneficiaries can plan large scale works.

The perceived opportunities are still not the objective truth. But towards the end of the discussions individual pay off structures showing switch in strategies as beneficial to all, may become a common knowledge²². The long process of discussion to establish common knowledge is specific to CPR - entrepreneurs do not need this. Negotiations and contracts ensure participation of others in institution of firms. In case of CPR these are replaced by communications and voluntarism.

Thus, the so-called second order dilemma has a trivial solution in a CPR situation. We can reformulate the supply process. Any new idea pertaining to the community benefit gradually becomes a common knowledge through the communication channels. Some ideas are rejected by the community, as faulty; a few are agreed to as promising alternatives. One can say that cooperation will have a *greater chance* of evolving under such circumstances. Whether it will survive and stabilise, is the next point of concern.

VII

CREDIBLE COMMITMENT AND CONVENTION

Cooperation may have a greater chance of evolving. But it is initiated on the basis of an anticipated pay-off structure, not on the basis of objective reality. Even during the commencement of the project the cooperators are aware of the many limitations of these anticipated structures. Everyone knows that the physical and technical data used might have been wrong, the design may have some unforeseen weakness, the monitoring and sanction measures may not prove to be effective, and so on. Added to these are the uncertainties regarding the free-riding possibilities of co-sharers. Credible commitment is therefore, unlikely at this initial stage. Only through proven success, over time, credibility increases, commitments become increasingly binding and conventions are

established. Thus credible commitment arises if :

1. the proposed activity actually proves to be beneficial
2. the internal mechanism and external support of monitoring and sanctions proposed actually work effectively towards the desired result of containing free-riding.
3. repeated occurrence of the same moves by the contingent strategists increases the credibility of commitments, and gradually elevates the responses to the level of conventions.

Thus, credible commitments and conventions are established only in course of time, through repeated successes. The concept of credible commitment pertains to individual behaviour. Its group expression is "convention", "norms" etc. The group attributes are the building blocks of sociology. The new institutional economics is thus able to reconcile the long-standing difference between economics and other social sciences. The approach has been two sided. From the discipline of sociology recent researches like that of Coleman (1993) have come to show the link.

VIII

REDEFINING COMMON PROPERTY .

In the light of the above discussions the basic postulates of the holistic theory can be redefined. These are :

- i. behavioural : (a) bounded rationality, adaptive learning
and social (b) existence of groups with internal communications
- ii. physical and : (a) subtractability
technical²³ (b) limits on the divisibility of and excludability from the resource.

The only addition made by me to the existing lists (North + Oakerson) is in the existence of groups with internal communications. This is the historical built up of (social) capital which need to be taken into account along with the physical and biological connections of the system. In other words, the nature of a common property regime is *path dependent* on the characteristic built up of this social capital in each society.

The two points marked as (a) are essential ingredients for institutions in general. In case one wonders whether subtractability is a general feature, here are the arguments. It is true that there are some abundant natural resources and public goods²⁴. Let us note that in the early stages of human evolution most of the resources were abundant for all practical purpose. Only at particular levels²⁵ of human activity, congestion occurs with respect to a specific resource. Thereafter, one person's use subtract from others' and for the first time, need arises for any kind of regulations on resource use. In other words, 'subtractability' is a better definition of 'scarcity' which alone makes economic considerations relevant.

The set of points marked (b) are specific to CPR. These are the basic building block of CPR, in the sense that they connect economics (and social sciences) to physical and biological systems.

Territoriality of certain birds and primates is a well-known fact. Its similarity with property rights in advanced societies cannot be missed. It has been noted that the characteristics and value of resources in relation to the costs of defending them from others' can predict territoriality (McCay and Acheson ed., 1990 : 17). We will enter into some details of this phenomenon. Since animal territoriality is an "institution", one can use the studies of institution to indicate the causes. There is an advantage in starting with the animal world -the "transaction costs" are not complicated by the complex developments of technology and society.

A primate territory is strongly defended ; in terms of management, "monitored" and decisions "enforced". The territorial size therefore, will depend on the feasibility of effective monitoring and enforcement. The enforcement aspect is taken care of by the characteristic of *excludability*, both by technical and social means, including by force. Not so well-understood is the problems regarding feasibility of monitoring. For effective monitoring a primate individual will have to go around regularly and use his senses like eyesight and smell. This determines the optimum size, beyond which effective monitoring is not possible. Thus, each animal territory has a regular size depending on its mobility and senses. Human beings generally are able to monitor the visible areas within short walking distances from their residences. Some forest gatherers, who spent weeks outside their homes, have much larger territories. Acheson (in Mckay and Acheson ed. 1990) in his study of lobster fiefs notes that in *nucleated areas*, which have much less fishery area per boat (hence much less to monitor), have strong sense of territoriality. The *perimeter-defended areas* however, have more area per boat than nucleated area. In other words, greater effort is needed for *adequate* monitoring of the whole territory. He observed that in these areas territoriality was strong close to the mouth of the harbour, where they anchor their boats, but grows progressively weaker the farther one goes from the harbour mouth.

Although manageable territorial size is primarily given by biological

constraints the limit can be pushed above by social and technical improvements. If a group undertakes the monitoring task together their total monitoring capacity is not just the aggregate of their individual biological capacities but can be somewhat more²⁶. Even in animal world therefore, group monitoring and enforcement is found. Among the human societies, these have developed far beyond groups making face to face direct communication. Advances in systems of communication, beginning with language, have helped to make great leaps into increasing group-based monitoring potential. Raising of the viable size through technical improvements are to be found only among the human species. These range from rapid transport facilities to closed circuit televisions in modern factories.

Group monitoring and enforcement is not always based on equality of monitors. Even in the animal world hierarchy is found among the members of a territorial group. In firms, monitors are paid employees, in CPR all beneficiaries are equally responsible. Different kind of organisations may be constituted for group monitoring. The choice among these forms is again decided by the *transaction cost*. Only if the benefits from the activity is sufficiently large, a group of remunerated people may be engaged for monitoring. But if the benefits are not so high then voluntary monitoring is the only way. Forests generally support the thesis of efficient management through CPR. But there are patches producing valuable black pepper, which are private properties. Those which I know are protected by electric fences deep inside dense rain forests. The case of high value oyster fishery too has been discussed.

But even in high productivity situation the viable group size is not unlimited. Williamson's (1986) analysis of the optimum size (upper limit) of firms brings it to the fore. He noted that with increasing firm size control is also lost. This is because there is a loss in the quality of data provided to the peak coordinator as well as the loss in the quality of instructions supplied to the operating units. Williamson states that this expression of bounded rationality imposes a (quasi)-static limitation to firm size through the mechanism of control loss.

The question that is central to our problem is - whether there is also a lower limit in optimal size of production units. In other words, why not privatise the commons? This question has been answered in two ways:

(a) For flow resources like water the natural and technical characteristics of : (in)divisibility and excludability along with transaction cost, explains the occurrence of lower limit in scale viability. Resources like groundwater aquifer, technology has not developed to permit exclusion of others from the resource system²⁷. It is indivisible. Surface irrigation is perfectly divisible. But below a certain size the transaction cost increases formidably. Even at that level technological development like automatic division boxes, may be available to effect exclusion by technological means alone, without any social regulations. But use of these to effect divisibility and excludability below a size makes costs of appropriation prohibitively high. Thus, these resources

cannot be divided below a threshold size.

(b) Although the same characteristics are used for explaining the cases of stock resources like forests, it is not easily appreciated. Land is a stock resource and agricultural land is privately owned. But forest land is a CPR. Why is it not divisible in the manner of agricultural land? Netting (1976) identified five attributes of land-use pattern to explain the occurrence of CPR. I feel, only two are sufficient. These are:

(i) value of production per unit area is low, i.e. productivity is diffused rather than concentrated.

(ii) area required for effective use is large.

Transferable resources like minerals and goods are brought to factory premises and stored for future use. The transferability helps centralisation within a tiny area, which immensely facilitates monitoring. It can be further facilitated by erecting a wall all around this tiny area. Marglin's well-known study²⁸ regarding the rise of factory system of production can be re-read as an innovation of an organisational form that facilitates monitoring. Non-transferable resources like land cannot be conveniently concentrated. Therefore, their viable scales are dependent on the human ability to do adequate monitoring. Either the scale is confined to biologically given limits of individual monitoring. Or the biological limits are increased by suitable social and technical improvements to rise up to the requirements of the resource. This is where Netting's characterisation enters.

In some activities like agriculture, the productivity per unit area is high and consequently, the minimum area supporting an individual activity (the area required for effective use) is small. A hundred farmers can reside in a single village and own the surrounding agricultural land as private property. Still the outer boundary of all these lands together will be within the biological limits of monitoring of each farmer. Not so about the forest or grazing land or marine fishery, where the aggregate area, for some meaningful activity of several individuals, is much larger. At the most, one or two individuals can have their private patches within biologically convenient locations, the rest will have no way to do adequate monitoring. There are two alternatives - either the close residential pattern fails and individuals start residing within their private properties. This is how isolated farmhouses come up. The other is to adopt group monitoring arrangements and treat the forest patch as a CPR. In this case it is the biological/social limits of the groups that determine the CPR size. The territory may appear very wide if there is no other claimant at the periphery. But the effective scale is limited - as in the case of lobster fishery example of Acheson cited earlier. It is not for any technological reason but for reasons of monitoring, that the limited divisibility character arises²⁹.

Technological development and resource characteristics together creates

the demand for a minimum size. The biological and organisational features regulate the supply of it. The demand and supply of specific sizes may not coincide. Neither of these are continuous, but optimum sizes with some permissible range of variations. For example, aquifer size is almost invariably larger than the group size permitting close communication. This dilemma is resolved only through the mechanism of nested enterprise - another design principle identified by Ostrom. - The supply side determines the nucleus size, the nesting of several primary units of CPR meets the demand scale.

The demand aspect, determined by technological and transaction cost features, is already recognised in the economic literature as *economies of scale*. On the supply side however, remunerative and contractual works are regarded as the only available form. If the nature of the economic activity permits³¹, institutions like firms, incurring significant cost in specialised and contractual monitoring, are viable. If it does not, utilisation of some other form for monitoring is the only way out. The existence of "connected" groups with well established communication channels, provide a suitable alternative. Meeting the optimum scale of economic activity with the social capital in the form of "connected groups" gives rise to CPR institutions. Organisations like firms, belonging to private property regimes, are not the only-viable form of economic organisations. Multitude of organisations exist which belong to common property regimes. They deserve to be studied with equal importance.

It follows from the discussion that CPRs can be associated with low productivity activities, though the relationship, mediated through the needs of intensive and extensive monitoring - does not provide the same threshold level for all activities. This however, explains why traditional societies have more of CPR. With increase, in productivity of different activities alternative forms like firms have come up in the human history. But this younger form of organisation has not yet become viable in every activity, one wonders whether it will ever be so³². Seen in this manner, CPR is not a traditional institution of historical interest. It certainly has a strong case for, and widespread existence in the developing countries, in some important economic activities. Accommodating CPR institutional forms along with firms in economic theorization will increase the scope of economic analysis in a very meaningful direction.

IX

LIMITS TO CHANGE

In discussing the problem of supply we have only solved the motivational question. It was indicated that the technological and financial constraints remain and determine the limits of change. As long as the initiator is dependent purely on his knowledge for designing the

alternative there is not much problem. Individual knowledge being a non-subtractable good with only fixed cost and costless reproduction features (Dasgupta and Stoneman, 1987 : 3) a rational individual would not mind incurring such cost for devising an alternative that benefits himself among others. Acquiring of that knowledge may be costly. In case of internal innovation/emulation, the knowledge base used is often the ones already acquired for other reasons or from earlier experiences. Some peculiar background or a distinct feature in the past history of an individual, may meet till's need³³. In case of conscious diffusion (systematic extension) by an agency, the agency must have sufficient return from the success of the programme to be interested in incurring the cost of extension*

But knowledge alone may not suffice always for this purpose. Some information required for designing may be costly, even substantially so, like meeting government officials at a distant place or engaging an expert for determining aquifer characteristic. Individuals as entrepreneurs, may be ready to contribute within the margin of anticipated additional benefit. Relatively large costs may be borne by the whole community in which case the very collection will be a case of co-operation with a prehistory of long discussion*. But in general, the CPR supply of alternative designs through internal mechanism are limited to very nominal investment. More often therefore, one finds, internally planned institutional changes in CPR are incremental. But the arresting factor is the lack of resources, the same as in any other form of enterprise. It will be improper to identify it as an inherent weakness of CPR alone. This makes a strong case for agency intervention and support.

I have confined my discussions of limits to change to mere designing of alternatives. Following the designs, investments have to be made in the construction of physical structures. The resource constraint is so easily understood here that no detailed discussion is necessary; one observes that many traditional CPR make considerable investment through labour contribution than through financial shares, or in engaging experts. However, given the right climate for functioning they may borrow and competently use the resource for making large scale investments. In absence of such facilities, the scope of designing and implementing the alternative is restricted.

An agency or the government therefore, has a very desirable role to play in CPR situations. Under their aegis, large scale investments can be made. But the agency, to be effective, must be strictly, a facilitator. If the beneficiaries are not allowed to design their institution, the collective choice rule, one of the prime requirements of CPRs, is violated. This however, is the more frequent cases. Examples keep on multiplying where externally imposed renovations plans have failed badly.

The costs of changing the rules vary substantially from one rule to another, from one political regime to another, and from one level of analysis to another. Particularly if the change concerns the top level in the hierarchy of rules the cost is high. Such transformations are often called social transitions - even revolutions. Since a CPR needs the

external **support**, including from the government, for proper functioning, there is not much rational in designing economic alternative when the political system is not conducive. A rational decision would be to invest in changing **the** political system, *as* Bates (1989) has argued. The incentive to invest directly **in** economic activity of CPE may be greatly increased if this contingent necessity of changing the political system is **eliminated**, if there is an appropriate government, policy for lending the necessary support to CPR.³⁴

In case of private enterprise, in competitive set up, information asymmetry makes the difference in income* Hence knowledge, innovation etc, tend to be secretive. In case of common property regime, secrecy has little to offer. Things tend to be common knowledge. Thus institutions determine the kind of incentive. Diffusion and extension are the major sources of growth in **CPR**; incentive to innovation is less*. As long as the institutional system functions smoothly (is in **the state of order** following **Nicolis and Prigogine, 1977**) there is little incentive to **change**. Only when there are considerable disorder **in** the system a self-organizing alternative may take over. Thomson, Feeny and Oakerson (in Bromley ed. 1992 : **132**) suggest **that** " Changes **in** relative factors or product prices, changes **in** size of markets, changes **in** technology, and changes in the fundamental decision rules of government are among the important variables **that** create disequilibria **in** the existing institutional arrangements and lead to institutional innovation.

X

PERFORMANCE OF CPR

How general is this concept of CPR ? Are these to be found only in traditional societies ? Are not these covering also open access **resources**, public goods ? Does it necessarily imply sustainability ? Are these efficient solution ? Do they always follow equitable distribution ? Such are **the** questions one must face at the end, I am **still** working on these **aspects**. The general **line** of inquiry is as follows :

North shows institutional performance is not necessarily efficient.

Even amongst animals, territoriality **is not** based on equity.

There is not much direct reason to assume that the "connected **group**" will have enough technical knowledge about, and always a long term consideration favouring sustainability (McKay).

On the other **hand**, the widespread use of low productive activities suggest developing economies are **still** very dependent on CPR. Wide

existence of social capital in the form of "connectedness" indicate that their development policies should wisely accommodate this form.

The thesis of the "tragedy of the commons" reduces the causes of environmental decay and economic loss to the nature of property rights. This diverts the question of sustainability from abuses and wastes - the question of efficiency - to absence of private property rights. McCay and Acheson (14) warned that "It may be ethnocentric to assume that, where property rights are exclusive (to village, clans, chiefs, or individuals) conservation is either the intent or the happy side effect".

In general the question of sustainability has been dealt with the assumption that privatization internalises costs and benefits and thereby increases individual responsibility for the rational use of resources.

The one advantage of CPR in pursuing sustainability is the extensive monitoring scope here. Everybody monitors under this set up. Hence

Efficiency as defined by North does not exclude such cases as :

- (a) weak strategy equilibrium in my book
- (b) graduated sanction.

REFERENCES

- Acheson, James A.**
1990 : "The Lobster Fiefs Revisited : Economic and Ecological Effects of **Territoriality** in Maine Lobster **Fishing**", in McCay and Acheson ed.
- Arrow, Kenneth J.**
1974 : *The Limits of Organization*, W.W. Norton and Company, New York.
- Bates, Robert H.**
1989 : *Beyond the **Miracle** of the Market - The Political Economy of Agrarian Development in **Kenya***, Cambridge University Press, Cambridge.
- Berkes, Fikret ed.**
1989 : *Common Property Resources - Ecology and Community-Based Sustainable **Development***, Belhaven Press, London
- Bromley, Daniel W. ed.**
1992 : *Making the Commons Work - Theory, Practice and Policy*, International Centre for **Self-Governance**, San Francisco
- Coleman, James S.**
1993 : *Foundations of Social **Theory***, Harvard Univ. Press, Cambridge, Mass. and London.
- Dasgupta, Partha and Stoneman, Paul ed.**
1987 : *Economic Policy and Technological **Performance***, Cambridge University Press, Cambridge.
- Haken, H.**
1977 : *Synergetics : An Introduction*, Springer Verlag, Berlin, 1983
- Hochfeld, Julian**
1965 : "**Oskar Lange** : As a Theoretician of Historical Materialism", in *On Political Economy and Econometrics , Essays in honour of Oskar **Lange***, Pergamon Press, Oxford
- Keohane, R. , 'McGinnis, M. and Ostrom, E.**
1992 : *Proceedings of A. Conference on Linking Local and Global Commons* , Harvard Univ, April 23-25, 1992 , mimeo
- Knudsen ? ?**

Langlois R. ed.

1986 : *Economics as a Process : Essays in the New Institutional Economics*, Cambridge, Cambridge University Press.

Laosby, Brian J.

1993 : "Institutional Stability and Change In Science and the Economy", in Maki et. al ed.

Maki, Uskali et. al. ed.

1993 : *Rationality, Institutions and Economic Methodology*, Routledge and Keg an Paul, New York.

Marglin, Stephen

McCay, Bonnie J. and **Acheson, James M.** ed.

1990 : *The Question of the Commons - The Culture and Ecology of Communal Resources*, Univ. of Arizona Press, Tucson

Nicolis, G. R. and Prigogine, I.

1977 : *Self-organization in Non-equilibrium Systems*, John Wiley and Sons, New York

North, Douglass C.

1990 : *Institutions, Institutional Change and Economic Performance*, Cambridge Univ. Press, Cambridge

North, Douglass C. and Robert P. Thomas

1973 : *The Rise of the Western World: A New Economic History*, Cambridge University Press, Cambridge.

Oakerson, Ronald J.

1992 : "Analyzing The Commons : A Framework", in Bromley ed. 1992

Ostrom, Elinor

1990 : *Governing the Commons : The Evolution of Institutions for Collective Action*, Cambridge Univ. Press, New York

1992 ; *Crafting Institutions for Self-Governing Irrigation Systems*. Centre for **Self-governace**, San Francisco.

P. Petit and R. Sugden,

1989 : "The backward Induction paradox", *Journal of Philosophy* , vol 86 : 169-82

Sengupta, Nirrnal

Thomson, J.T. , Feeny, D, and Oakerson, R.J.

1992 : "Institutional Dynamics : The Evolution and Dissolution of
Common-Property Resource Management", in Bromley ed. 1992

Vanberg, Viktor

1993 ; "Rational Choice, Rule-following and Institutions : An
Evolutionary **Perspective**", in Maki et. al ed.

Williamson, Oliver E.

1986 : *Economic Organization - Firms, Markets and Policy Control*,
Wheatsheaf Books, Sussex

ENDNOTES

L International Association for the Study of Common Properties

2* Ostrom identified two sources of uncertainty ; (i) external,, which includes from rainfall to market price and (ii) internal,, where she talks of various matters like uncertainties regarding the boundary of the resource system, uncertainty about the effect of excess diversion at head of a canal on a tail end farmer, possibility of reduction of uncertainty through, skilful pooling and blending of scientific and local knowledge, the ingenuity of solving problems etc. She also talks of passing of folk knowledge from generation to generation. Most of these are physical and technical uncertainties and reduction is achieved by technical **improvements**. These should legitimately be included within the topic of scientific knowledge and physical designs of the production **system**.

3. "Let me turn the game upside down. Cooperation is difficult when the game is not repeated ... These polar extremes in fact reflect real life contrasts." (p. 12)

4. Implicit in the behavioural assumption of bounded rationality is that the perceived structure of decision makers need to be distinguished from the real world, Simon had made this point long back and North used it to indicate that "... institutions may be very inadequate or very far from optimal .. " (p. 23),

5. Ostrom (p. 35) assumes -. rather unnecessarily - that the time horizons of local fishers in relations to the yield of the inshore fishery, extend far into the future. They hope their children and children's children can make a living in the same location.

6. In some cases it is possible.

7. It can also be lesser. That was of theoretical interest since in such cases there was no reason to form aggregates. However, **inefficiency of** organisations beyond a size (e.g. Williamson) is a matter of research in social sciences. Hence this negative consequence should not be **overlooked**.

One of the earliest proponents of this idea was Oskar Lange. See Hochfeld, 1965

8. This is why I used the term - albeit improperly - in my book (Sengupta, **1991**:). For an introduction see Haken, 1977

9* I have some reservations regarding the last two. Discussions by Oakerson as well as the case studies that follow, show that these two heads include information which belong to "organizational" and "performance (including assessment)", following North's terminology. However, one-to-one correspondence cannot be established between these two sets of terms - the exposition of Oakerson's framework by himself and others, show considerable overlapping.

10. following Ostrom, p. 39

11. This line of defining utility has been another departure from the neoclassical models. North (1992 :) provides a brief **description**.

12. I had described that such a strategy is "more likely choice of human beings ... a species with considerable *memory* and *decision making ability*" (Sengupta, 1991 : 23).
13. For a discussion see Vanberg (1993 : 187)
14. Some say it is more Lamarckian than Darwinian.
15. North cites (23-4) Ronald Heiner's CD theory as an attempt. Loasby (1993 : 206) stresses Simon's position -- creativity normally flourishes most when its scope is limited.
16. In p. 187 Ostrom says : "Adopting contingent strategies enhances the likelihood of monitoring. Monitoring enhances the probability of adopting contingent strategy". I differ with this statement in stress. These are two sides of the same coin, there is no choice or probability involved.
17. For an excellent discussion see Langlois, 1986.
18. For a good discussion see Knudsen (1993 : 265-299)
19. Such rule making has the following properties :
- (i). rules are so chosen that their monitoring costs are less
 - (ii). accepted rules are also those which can be enforced
 - (iii). rules can be improved and revised.
20. This is why participatory programmes have discovered that involving farmers from the planning and designing stage is a more successful approach.
21. I have recorded a few such cases of designing through discussions in my book. Particularly notable is the EMFISA case. Far from a sequential and incremental kind of work, the project designed by the farmers was of constructing a four kilometre long channel through hilly terrains, relying on their traditional implements alone. They constructed it over four years of hard labour.
22. Probably in a great many cases of such project proposals, the discussions also lead to identification of the weaknesses of original proposals and subsequent rejection.
23. Following Oakerson's framework.
24. Within the scope of our discussion, public goods too can be included within resources, without any impropriety.
25. This is not necessarily an evolutionary stage. For some reasons, like natural disaster or invention of new processing methods, a resource, once scarce, may also become abundant again.
26. following synergy principle.
27. Ostrom differentiates (p.30-32) between *resource system* : as a stock and *resource units* : as the harvest flow. The actual process of appropriating resource units from the CPR can be undertaken by multiple appropriators, simultaneously or sequentially. The resource units are however, not subject to joint use or appropriation. Thus, *jointness*

(indivisibility) of the resource system and subtractability of the resource units characterise the system.

It is costly to exclude one appropriator of a resource system from improvements made to the resource system itself. This makes free-riding tendencies ever present.

28. "What do the bosses do ?"

29. I will favour a different name from divisibility and excludability, for describing the quality introduced here which gives rise to CPR in forests and marine fisheries. But till now I have not come across a suitable term .

30. Also diseconomies, following Williamson.

31. It appears that this is determined by relative magnitudes of productivity and the cost of adequate monitoring (intensive and extensive). Low productivity with low transaction cost are grazing lands. Relatively high productivity with considerable transaction cost are CPR in water and forests. High transaction costs being accommodated by very high productivity are modern factory production, plantations etc.

32. Technological and economic developments may act towards elimination of the limit making the case for CPR weaker and weaker. At the same time however, previously abundant resources become scarce and some of them create new CPR situations. I believe there will always be some activities in use which are of low productivity, still desirable and essential. Institutions like CPR will always be the appropriate form for their management.

33. In my book I had shown such peculiar backgrounds of the initiators. See the cases : Thulukankulam, Tanwan, Simbaluca and Emfisa organisations. In general, studies have established that major innovations come from those who have, for some reason, access to other frameworks, e.g. immigrants among the builders of successful businesses. For a discussion, see Loasby, 1993 : 217-8.

34. It may be undesirable to pamper the status quo. We are only indicating the mode of functioning. The existing "connectedness" in the society and the consequent CPR organisational forms may be undesirable from social choice considerations.