

Management, Resilience and the Strategy of the Commons

The understanding of the interdependencies between social and ecological systems in relation to the concept of resilience contains two basic dimensions, time and space (cf. Holling, 1986; Holling, Gunderson and Peterson, 1993). On a methodological level the first has to do with the problem of what time frame the interplay between ecological and socioeconomic systems should be analyzed. The contemporary debate about global warming is one example of this problem; should possible changes be assessed in the perspective of years, centuries or perhaps millennia? Since humans are social creatures we have rather good historical records about the development of society. However, when it comes to the history of the very interplay between social and ecological systems the information is much scarcer. The uncertainties concerning the magnitude of the possible deforestation in Africa is one example of this. No one really knows how much forest there was before the colonialization? Who can really tell, since there is a significant lack of, forest data from that period (Gibson, McKean, and Ostrom, 1996)? Moreover, even if there were such data available, to what specific kind of behavior or decisions could observable changes be attributed.¹

The other problem, the space problem, can be exemplified with some findings from an ongoing research project dealing with the Russian forest sector.² For example, it has been revealed that in West Siberia and many other Russian forest regions a systematic over-cut has been conducted mainly along the most important transport routes (cf. Carlsson & Olsson, 1998; Carlsson, et al., 1999). However, this local over-cutting has sometimes been “compensated for”, and thereby also hidden in the statistics, by an undercutting in other areas. The reality is that in many regions, for example in the Arkhangelsk and Tomsk Oblasts³, most of the territory contains immense forest resources with around 60% of the area covered with mature or over-mature forests. In other words, the ecological system has reached its climax the so-called *K*-phase, and is open for sudden

¹ This is the challenging undertaking of the so called IFRI program that is built up at Indiana University (Ostrom, 1995).

² This research is conducted within the Sustainable Boreal Forest Resources Project at the International Institute of Applied Systems Analysis (IIASA), Laxenburg, Austria (<http://www.iiasa.ac.at/>).

³ Oblast: administrative region; a constituent part of the Russian federation, a so-called federation subject.

releases of resources (? -phase), such as pests and forest fires.⁴ What is the proper scope of analysis? Should we only look at the over-cut areas or should we take the whole Oblasts, which are of the size of France, in to consideration? In fact it can be argued that both the over-cut areas and the pristine, over-mature forests can be understood in terms of loss of resilience with a potential of causing ecological “flips” to completely new ecological systems. For example, in the most easily accessible areas where forests have been clear-cut, without any regeneration efforts, land has turned into bogs, where pine and spruce might be replaced with aspen, and so forth. In the other over-mature areas, we find huge stands containing dead standing trees that are ridden by fire, pests and diseases (Nilsson & Shvidenko, 1998). How extensive or small should our units of analysis preferable be in order to provide a foundation for any reliable conclusions regarding causes and effects of social activities and related ecological changes?⁵

Without pretense to give an unambiguous answer to these time and space problems one might argue that it is desirable to have at least as long historical records, both regarding the social and the ecological systems, as corresponds with the renewal cycle of the ecosystem under focus. This is said in full awareness of the fact that all ecosystems contain several time frames while they are lacking single equilibria. However, “critical processes [of an ecosystem] function at radically different rates covering several orders of magnitude, and these rates cluster around a few dominant frequencies” (Holling, Gunderson and Peterson, 1993:2). Thus, it can be argued that for boreal forests records, which cover time periods of one to two hundred years, might fulfill the criterion.⁶ Such records, however, are rare. The big hurdle seems to be the forest data, i.e., information on how much forest there were and what they looked like many hundred years ago.

This paper, however, is based on some unique data covering an area of about 80,000 ha of boreal forest lands in Sweden for a period well over one hundred years. The purpose of the paper is to demonstrate how two different management systems, one emanating from State ownership, the other from Communal property rights, affect the ecosystem over this significant period of time.

⁴ This refers to a frequently used heuristic which describes the dynamics of ecosystem functions through phases: exploitation, conservation, creative destruction, and renewal (Holling, 1986:307; Holling, Gunderson and Peterson, 1993:5)

⁵ Those who advocate the so-called Gaia Hypothesis (Lovelock, 1995) would perhaps answer that the proper unit of analysis is the whole globe, since it is believed to function as a coherent organism.

⁶ Following this rule one might imagine the problems of applying a proper time frame for the analysis of a Sequoia forests.

Since the time frame is more than a century, for which we have detailed forest records, it can, thus, be illustrated how different modes of management affect the forest resource.

Community Managed Forests, Living History

Sweden is one of the most forested countries in the world and from time immemorial the utilization of the resource has been more or less regulated, first through the medieval county laws and later by the laws and regulations enacted by the King and the State (Mattson and Stridsberg, 1981:68-73).⁷ However, up until the mid-19th century forests had limited commercial value for the vast majority of farmers. Along with the rapid industrialization the situation was suddenly changed. The first steam-driven saw mill began to produce marketable wood in 1850 and the first pulp plant started in 1857 (Stjernquist, 1973:51). This development speeded up the process of *Delimitation of Crown Land* that had started in the 17th century. The purpose was to once and for all decide the ownership of land, especially in the northern “unregulated” areas. After 300 years the process is now regarded as finished.⁸ The process of delimitation of crown land proceeded together with another change of property rights, *The Great Redistribution of Land Holdings*, starting in the middle of 18th century. During this time, a great number of common lands were privatised (cf. Sporrang, 1998). Nevertheless, these processes also triggered a policy resulting in the creation of vast areas under communal management and ownership. The first of these, still existing, community managed forests, named *forest commons*, were established in 1862.⁹ All subsequent units got, and still have, virtually the same organizational form. Collectively, the commons is the sixth biggest forest owner in the country.

The first reason for creating these units was to prevent forest companies from unsustainably exploiting the forests and thereby ruining the farmers. The second, but related aim, was to strengthen the local economy and thus to establish a solid basis for taxation. It might also be added that vast un-populated areas were regarded as a potential weakness in times of war.

In this chapter we will concentrate on the change of the forest resources on two, adjacent pieces of land which were both established as a result of the described process of delimitation. The first is Orsa Forest Common and the other Hamra State Park. In 1884, when they both were established, Hamra was composed of 25,669 ha and Orsa of 53,301 ha of productive forest land.

⁷ The first national forestry law, which was a frame law, was enacted in 1903 (Stjernquist, 1973:78 ff.).

⁸ Not when it comes to the property rights of the Saami people, however (Bengtsson, 1994).

Both units were detached from an area that still in 1913 was defined as “untouched pristine forest”. Consequently, the forest density in terms of number of equal-sized trees per ha was quite equal (Fredenberg, 1913:235; 1924). Thus, we have two excellent cases for comparison applying a “most similar systems design” (Przeworski & Teune 1970). The logic would be that if we, after one hundred years find differences in the forest resources these should be attributed to institutional features. Do we find any such differences?

Devastation, Management and Renewal

Figure 1 illustrates the change in forest biomass over an extended period of time. As can be seen there was a dramatic reduction of the resources in Orsa forest common, actually 50 percent reduction of the volume in ten years, just before the turn of the century. This period is called the “dimension felling” meaning that all over the country much of the old and overmature trees were cut.¹⁰

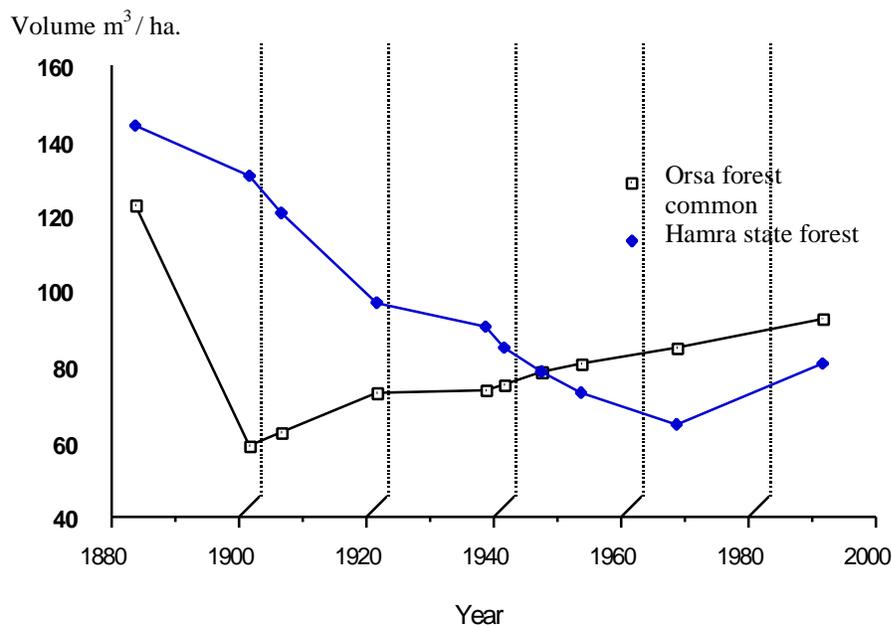


Figure 1. Forest resources in Orsa Forest Common and Hamra state forest (Source: Linder and Östlund, 1992:203)

⁹ It should be noted that the organizational structure of these commons dates back to medieval times.

¹⁰ With reference to the introduction it might be worth mentioning that the situation that triggered the “dimension felling” was similar to much of the forests in contemporary Russia where huge areas contain unexploited and overmature stands (Nilsson and Shvidenko, 1998:10). For a discussion about the possible benefits of introducing community management in the Russian context, see Carlsson, 2000.

However, due to deliberate regeneration there has been a steady restoration of the resource. In the adjacent state forest, however, the volume continued to decrease through the next 70 years! However, neither the common nor the state forest have retrieved the volumes they had by the turn of the century. How can these two types of behavior be explained?

Hamra State forest was managed by the State Forest Service in line with a centrally decided management policy based on scientific doctrines of the time (Östlund, 1993, Ch. 4, p. 7). It should be emphasized, however, that both units operate under the supervision of the same type of professional foresters educated at the same Swedish school of forestry. The manual workforce was recruited among local farmers, who provided horses and men under the cutting season. Therefore, there were no differences in the quality of labor or technology that operated in the Swedish forests at that time (Lundgren, 1984). The big difference is the ownership and organization of the units, and presumably this had decisive effects.

Like all forest commons established as a result of the delimitation of crown land Orsa Forest Common is also based on a community of single farmers of about one thousand individuals.¹¹ In addition to their private lands these farmers hold shares a bigger, jointly owned area, the forest common (cf. Carlsson, 1995, 1999). In this way each farmer is the legal owner of a private piece of property, his farm, as well as a certain amount of shares of a common property. Even though many farmers jointly owned the commons they are, however, not cooperatives. Most farmers possess about the same number of shares but bigger farmers often have more. It is worth noting that the shares are connected to the farm and cannot be separately traded. This organizational form is a mix of collective and private property rights, which might give the system some advantages that will be discussed later.

Each common is regulated by its own by-law (approved by the assembly of the shareholders as well as the state authorities) and a special law governs all 33 units. Among other things, this law stipulates that the forest area must not be diminished and that each unit must appoint some person with professional knowledge in forestry, typically a forester, to manage the land.

In each common the assembly of shareholders, among themselves, elects a board, which, together with the appointed forester, governs the unit. Although larger shareholders have more votes in the assembly there are rules that prevent dictatorship. To a great extent, most units

function as forest companies: they harvest their timber, cultivate their resources and distribute their profits among the owners. Two principles, often working in parallel, exist for distributing the revenue. The first is to distribute the profit as annual cash dividends to the farmers in accordance to their possession of shares. A second way of distributing the profit is to “subsidize” farmers for the investments they make on their own private farms. For example, farmers are reimbursed per hectares of regenerated land, for draining, rebuilding of barns and cowsheds. The principles for this subsidizing are decided by the assembly of shareholders and vary among the units. In many commons a significant part of the profit is spent on the maintenance of public and private roads.

These ways of strengthening the local economy have historically been of great significance. For example, the commons have been very important contributors to the electrification of the northern countryside, the establishment of dairies, insemination stations, etc. The forest commons still run local sawmills, power plants and other subsidiary enterprises for the benefit of the areas in which they operate. During the course of time the policy of the commons has gradually been changed from supporting farming to forestry.

The Behavior of the Commons

It should be emphasized that the Orsa/Hamra forest of 1884 could be characterized as a brittle over-connected system, fragile to sudden changes. Indeed such a sudden change also took place in Orsa while the transformation in the state park was less dramatic. In order to understand the initial difference in behavior one should consider that the type of forestry that was commonly used was developed and governed by State Forest authorities. The debate between those who advocated *patching*, i.e., cutting of small patches/glades in a stand that was naturally regenerated, and those who argued for larger undertakings and deliberate regeneration programs is revealed in contemporary journals.¹² Patching is a method that had proved effective in the southern parts of Germany and Switzerland, where beech and spruce easily populated the shady openings caused by this felling of groups of trees. Already since 1865, the Swedish State authorities had widely used the method, especially in the northern, forest rich, parts of the country (due to the harsh climate here the method was associated with negative results however) (Mattsson and Stridsberg, 1981:47 ff.). As a consequence artificial regeneration was uncommon. Thus, between the beginning of the

¹¹ Note that being a farmer was also associated with ownership of forest lands. Today the ownership structure is more heterogeneous but still farmers constitute the major group.

1920s until the mid-forties there were a significant decrease of seedlings and plants provided by the county forestry boards. “The forestry boards ? like the forestry experts as a whole ? made propaganda for natural re-growth, to be achieved by making suitable large glades in the stands. The natural re-growth was considered preferable to forest planting on larger cut-over areas. The consequence of this of course was that the interest of forest owners in forest cultivation declined until opinion swung around.” (Stjernquist, 1973:66). By the end of the 19th century large scale management, characterized by scientific planning and the idea of “order” (G. “ordnung”), borrowed from the 18th century German forestry,¹³ had become popular in the whole of Europe. But, by the end of the century, patching became dominant again (Mattsson and Stridsberg, 1981:46 ff.).

So, what happened in the communal forest was that the farmers gave their forester the approval for a type of forestry that required an intensive regeneration program while the state foresters at Hamra State Park more or less relied on the conventional wisdom and state of the art forestry of that time. Why did the farmers dedicate such efforts in order to replace what had been taken away from their lands?

Unlike the State managers who managed Hamra state forest, the farmers who had established Orsa Forest Common were directly dependent on the outcome of their forest management. For example, the inhabitants in Orsa paid no municipal taxes until the Second World War. The forest contributed all the resources that were needed for public works and services. The forest was regarded as their savings account, and the increment their interest rate. What would they and their successors eventually live off when all the trees were gone for at least 100 hundred years? The state forest can be assumed to operate according to another logic and with a significant information delay from the local level to central decision-makers. No one, except perhaps the taxpayers, would have any personal incentive to bother about forest productivity. This gives support for the old insight that “state governance does not necessarily ensure sustainable use. Given that the officials who make decisions do not have the same time horizon or interests as private owners, the general public, or the government itself, this is not surprising” (Feeny et al., 1990:11).

¹² One such journal is *Skogsvårdsföreningens Tidskrift*.

¹³ For an overview of the history of German forestry see Klose, 1985.

It should be emphasized that it is not claimed that the behavior in Orsa is “good” while the behavior of Hamra state forests is “bad.” If sustainability means a preservation of the biomass that happened to exist in 1880s, i.e. ‘stability’, both actors have failed. (See Holling, 1986:296 ff., for a discussion about the difference between the concepts of ‘stability’ and ‘resilience’.) However, compared with the situation in 1890 the common has lost less of its volume. What the diagram intends to illustrate is more the conscious efforts by the farmers to regenerate their forest and thereby to stop the shrinking of the resource.

Figure 2 illustrates a somewhat peculiar behavior using another community-managed forests in the same area as an example. The diagram covers 107 years of revenue distributed among the shareholders. What might be striking is that the economic revenue is so evenly distributed over the years. One should remember that the time that is covered by the diagram contains a “pre-democratic” period, the birth of liberal democracy, severe economic recession, two world wars, industrialization as well as the birth of the information society. “Although formal rules may change overnight as the result of political or judicial decisions, informal constraints embodied in customs, traditions, and codes of conduct are much more impervious to deliberate policies” (North, 1991:6). The only dramatic change that is observed is in fact caused by a sudden change in the taxation rules!

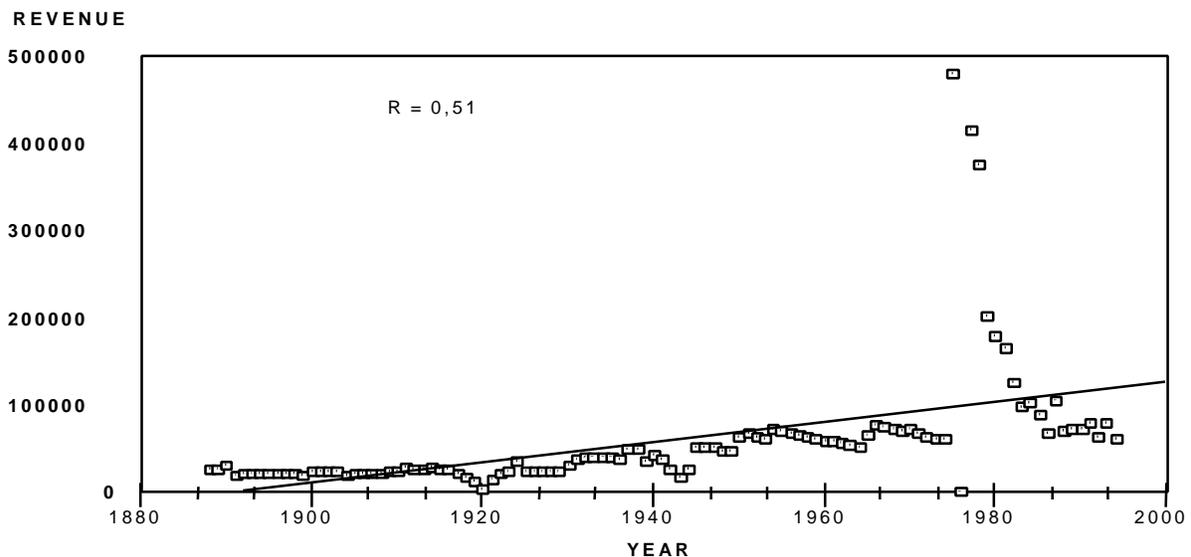


Figure 2. Revenue distributed among the shareholders during 107 years in the community managed forest of Enviken (SEK, adjusted for inflation). (Source: Carlsson, 1995:31)

Although it is rare to find such detailed data from more than single forests recent research indicates that over a significant period of time the Swedish forest commons have generally adopted a policy based on the idea of a “target income” (Carlsson, 1999). Such a policy has the effect that the community-managed forests have a tendency to harvest less when timber prices rise. Whether this behavior reflects a concern for the forest resource or whether it is simply an effect of the fact that farmers might prefer to sell timber from their own private lands in times with high prices is hard to decide. The result is the same however, namely, that the commons provide a sustainable yield at levels way under the annual increment (Carlsson, 1998:85). It is in this perspective the behavior of the Orsa farmers should be viewed. Even though the management system deliberately caused a sudden flip by the turn of the century a conscious regeneration, i.e., a reorganization, of the forest has taken place. No overuse is reported while a deliberate policy to generate “even” incomes rather than to “fluctuate” with changes in timber prices has been practiced. It should be emphasized that still today the community-managed forests in Sweden are regarded by experts as well managed and that they show an environmental concern that is in line with, or better than, other forest owners.¹⁴

Supposedly such a system, which is based on the judgments of farmers who literally live in the middle of their forest, is more sensitive to changes than more rigid decision systems like what the Hamra State Park illustrates. Figure 3 and 4 further illustrate this. The figures show differences in harvesting behavior among all state parks and six community-managed forests, comparable in size, in the same county over a period of 14 years. What is revealed in the diagrams is that the state management units have a tendency to act in the same while the behavior of the community forests are more dispersed.¹⁵ This has probably to do with the circumstance that local factors cause the community managed units to act differently because they are in different “phases” of their forest management. If, as research indicates, they have a target income it would, in fact, been unlikely that they had the same needs of more income exactly the same year. Thus, also their responses to

¹⁴ This statement is based on interviews with experts from the State Forest Service in all the districts where community forests are located (Carlsson, 1995). The Swedish Commission on Collectively-Owned Forest Lands, Ds Jo 1984: 15, (Swedish Ministry of Agriculture) came to the same conclusion.

¹⁵ It should be emphasized that private forest owners act in a more “capitalistic” way, i.e., when timber prices raise they harvest more (Carlsson, 1995)

the changes in timber prices are different because they have different needs to reach different targets.

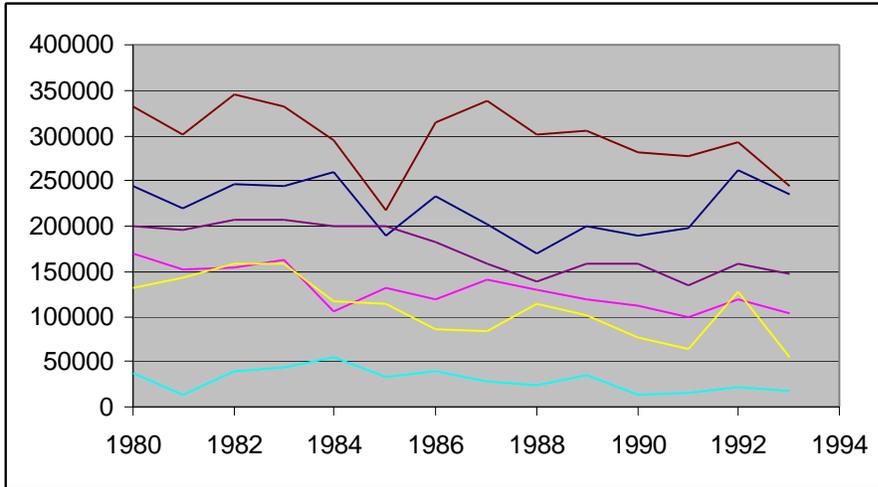


Figure 3. Harvesting in six Swedish state forests, 1980-1993.

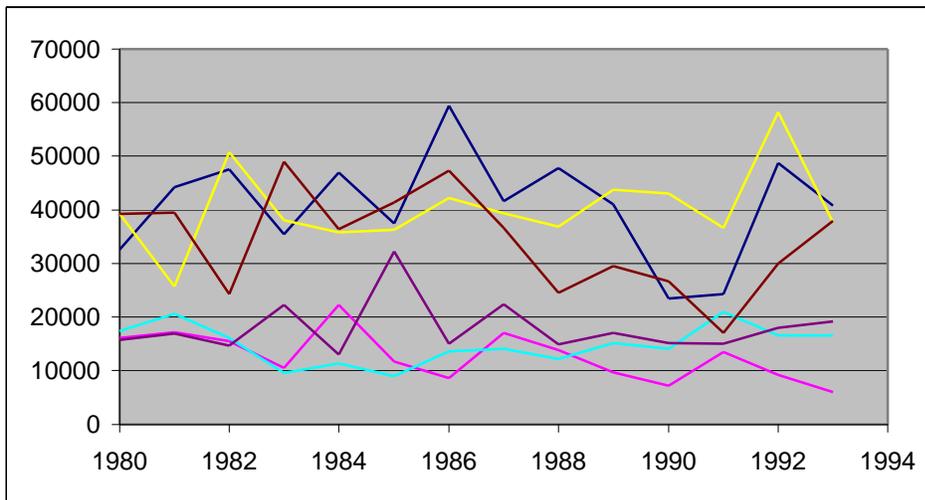


Figure 4. Harvesting in six community managed forests, 1980-1993.

After calculating the correlation coefficients between the variation in harvesting among the forests commons, as an effect of timber price, it is furthermore revealed that there exists no significant correlation what so ever among any of the units over a time period of fourteen years. For the state forests the corresponding correlation ranged from 0.66 to 0.77 (six significant). This

means that when a state owned management unit changes its harvesting level as a response to price fluctuations, it is likely that many of the state owned units do the same.

Discussion

What can be learned from these examples and the contrasting of state management with that of communities of farmers? First, one might emphasize something that has already been discussed at length, namely, that cultural, geographical and other factors have made it beneficial for different groups to develop their own *well-tailored*, often community based, systems which have demonstrated a remarkable viability (cf. Netting, 1981; Ostrom, 1990; McKean, 1992; Mckean & Ostrom, 1995; Merlo, 1995; Berkes & Folke, 1998). In this respect the described forest commons are no exceptions. What might be remarkable is that, by the turn of the millenium, they still seem to operate quiet successfully. Private property and state property are, thus, only two among a number of alternatives. In fact, communal property is, not seldom with great success, combined with private property rights (Ostrom, 1996; Eggertsson, 1998). These solutions are by no means a feature of developing countries only. Community-management of property has an important role to play also in advanced market economies (McKean, 1992; Arnold, 1993; Buck, 1995; Mckean & Ostrom, 1995; Merlo, 1995; Eggertsson, 1998, p. 60; Carlsson, 1999).¹⁶

All successful institutional arrangements for the handling of natural resources must be adaptive. A basic prerequisite for this might be that rights to access and appropriate resources are well defined, that the rules are decided by the same people who are affected by them, that monitoring and sanctioning are executed on behalf of the owners, to very low costs, and so forth (for an elaborated discussion, see Ostrom, 1990, 1992; Bromely, 1992; Carlsson, 1999). Given this, we might ask what makes the farmers of Orsa and the other forest commons inclined to manage their forests in an sustainable way? The easy answer is found in their “closeness” to the resource. Obviously they apply a management structure that is sensitive to changes in the ecosystem. Consider how the behavior of the state forest –as compared to the forest common in our example– may be understood in terms of coping with the forest resource, Figure 5 below.

¹⁶ Compare for instance condominiums, neighborhood organizations, and car pools.

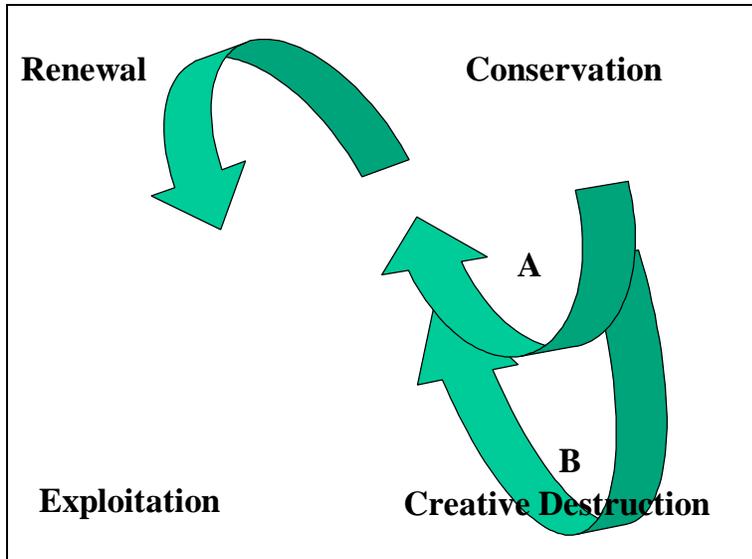


Figure 5. Management styles in relation to four ecosystem functions.

Immediately after the brake down of the brittle system, i.e., when the overmature forest had been cut, farmers initiated a deliberate regeneration program. This, combined with a harvesting policy based on a target income goal rather than profit maximizing, made the resource recover and renew itself (arrow A in Figure 5). In comparison, another type of policy, practiced by the state, caused the resource to continue its decrease for a much longer period of time (arrow B in Figure 5). If forest density is a goal in itself one can say that, in the latter case, due to a more rigid management the *destruction* was stretched out while density was accordingly reduced. Whether one behavior is good and the other is bad might be a matter of time. We can also say that it is a matter of two different modes of resilience, i.e. in both cases “the ability of [the] system to maintain its structure and patterns of behavior in the face of disturbance” is maintained (Holling, 1986:296). However, the behavior of the forest common seems to be more responsive to changes in the environment.

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