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Socioecology of Stress: Why Do Common Property Resource Management Projects Fail?

Anil K. Gupta

INTRODUCTION: A SOCIOECOLOGICAL PERSPECTIVE

In a stratified rural society, different classes of landless pastoralists or cultivators-cum-pastoralists can be expected to have varying stakes in protecting the environment. They also have differing expectations of the kinds of assurances (see Runge, this volume) that they should receive from the various institutions that control resource use. These expectations may vary over time depending on the extent to which the availability of the resource is affected by environmental change. However, other factors, separate from the vicissitudes of the environment, also alter expectations: accumulated deficits or surplus in household budgets, mobility patterns, and simultaneous operations in factor and product markets alter the amount of insurance that different classes seek to cover risks in the future supply of common resources. The implication is that "assurance" institutions that serve different classes, and hence that have varying obligations, do not emerge only through changes in factor prices alone. The central question thus is how such assurance was provided in traditional societies and why modern projects frequently fail to provide it.

This paper offers a brief discussion on the socio-ecological perspectives for explaining differential stakes of various classes in environmental management. Then,

using the conference framework, a case study is presented, followed by some tentative policy implications as well as questions for further research. The focus is on agricultural endeavors in drought-prone regions.

The key ecological and institutional characteristics of drought-prone regions are listed below:

- Low population density
- High risks inherent in various crop, livestock, craft enterprises
- Current level of farmers' technology generally geared towards risk minimization rather than profit maximization
- Uncertainty of rainfall and lack of local employment opportunities that invariably lead to seasonal (or to some extent permanent) migration with the implication that often the households are managed by the women or the old people
- The capital absorption capacity is very low with the result that the institutional infrastructure is very poor
- Social and cultural networks are characteristically different from the irrigated regions, particularly with regard to the extent of traditional forms of cooperation and pooling of resources that exist in such regions to augment the extended family systems.

The key element of the socioecological perspective is that the ecology defines the mix of economic enterprises that different classes of farmers have found to be sustainable in a given environment. Different classes operate different enterprises at varying scales, depending on their respective access to credit, product, and labor markets. Thus, when we find larger farmers owning predominantly high-value grazers, while the poor own browsers (as was the case in our study), it is not difficult to deduce the amount of access and resource use options accorded to each. Not surprisingly, each group had different perceptions of and responses to risks. It appeared thus that different classes of farmers used different measures (i.e., discount rates and time periods) to appraise their returns in various resource markets depending upon their knowledge, skills, resource advantage, and future expectations as well as their current or projected surplus, subsistence, or deficit budget conditions. The cash flows resulting from the risk-return trade-offs might

be more unstable for some than for others; some households accumulated surpluses while others became chronically in debt. The decision-making options of such farmers were obviously different, as were their investments in the level of productivity of the environment.

One of the characteristic responses of different classes to changes in the environment (availability of dry matter from common grazing lands to supplement the fodder from private lands) has been to modify the livestock/space mix, which often exacerbates ecological imbalance. Studies have shown that in the event of drought, farmers-cum-pastoralists tried to dispose of heavy grazers (cattle and buffalo) first and browsers (sheep and goats) last (Gupta 1984a). Consequently, a region that has faced successive droughts may well become biased in favor of browsers instead of grazers, particularly if large-scale population migration is prevented through public investments in drought relief.

When we summarize the important bearing of this approach on the Oakerson framework, the policy implications become richer:

- The fact that livestock species-mix is class- and eco-specific implies that in any region the technical and physical conditions of resources endowment would be defined differently by different classes. In other words, the catchment area where the dry matter is derived for sustenance of the livestock would vary in a characteristic manner for different classes.

- In view of the above, the village common lands' vulnerability to degradation would also be different. At the same time, rich and poor may be disinterested in protecting common land for very different reasons. The rich have access to dry fodder from crop residues; in the main, they own grazers that do not migrate widely, hence their dependence on commons is relatively small. The poor, on the other hand, own smaller individual herds biased in favor of browsers that demand extensive labor mobility; their payoff from the increased dry matter supply from the village's commons is therefore not significant. However, in cases where male members migrate from an area and the households are headed by females or older

people (which is quite common in drought-prone regions), the commons may become seriously degraded without much concern from the herders, whose household cash flow is never great and who would require a significantly higher payoff to be induced to change their habits of resource use.

- o The discrepancies in access to commons as well as to such private lands such as fallows (which were generally used as common grazing land in the dry season) require that the Oakerson framework be applied from the perspective of those who are losers in the game, instead of from a holistic or a community perspective.

SHEEP AND PASTURE DEVELOPMENT PLOTS: A CASE STUDY

Under a World Bank project (World Bank 1984) for development of drought-prone areas, 100-hectare sheep and pasture development plots were established in 1974 in the Jodhpur district of Rajasthan state, an area of 222,860 sq. km, and population (in 1971) of 1.152 million. The key objectives were the conversion of lands not used for agriculture, the maximum utilization of rainwater, the prevention of migration of people and animals in famine years and, to achieve all of these, the organization of a cooperative of the weaker sections of sheep breeders. These plots thus were to provide demonstrations of technological alternatives for better rangeland management and possibilities of group action through the organization of sheep growers' cooperatives. In all, 49 plots of 100 hectares each were developed between 1974 and 1984.

Jodhpur district had a livestock population of 1.89 million in 1971. The mean rainfall ranges from 425 mm in the southeast to about 200 mm in the northwest. Traditionally, the private fallow lands were also treated as common land, although this practice is becoming more and more restricted. Cultivators have begun objecting to the use of their fallow lands by other pastoralists, sometimes to the point of violence in many parts of the country.

The pasture plots were to cover only a fraction of the total waste common lands in the district, nonetheless, the expectation was that once local people were convinced of the utility of restricted grazing they might choose to

develop institutional alternatives for conserving the village common land and private wastelands as well. The program was to organize cooperatives that would buy share capital (preferably in kind, i.e., sheep). In general, the most degraded land was selected for initial improvement. It was expected that after the full development of the plots, a maximum of 400 sheep could be maintained on a year-round basis in each plot.

One of the first pasture plots established on degraded auran lands in Bhawad village was selected for detailed analysis. (The word auran is derived from the Sanskrit word aranya, meaning forest. Historically, auran was a traditional institution signifying the concern of the people towards conservation of common lands.) In these lands, grazing was restricted; not even twigs from dead trees were collected for domestic consumption. People were restrained from using auran land for any individual purposes because the land was dedicated to various gods or goddesses respected in the region; the use of any water source was also restricted. In general, the carrying capacity of a plot could never increase beyond 33 adult cattle because of successive droughts.

The soils at the study site are shallow, poorly drained, severely eroded, saline and alkaline in nature, and have very low organic matter. The temperature ranges between 2°C and 45°C, and the rainfall pattern is extremely erratic, with an annual average of around 300 mm. Because of excessive grazing pressure, such coarse grasses as Aristida spp. and other useless herbs (such as Techrosis spp.) had been dominant in the area (Joshi and Jain 1979). Cenchrus ciliaris grass was seeded in the plot.

The plot is located at the intersection of two different ecological units. (The village of Bhawad is situated in ecological unit number one and borders on ecological unit two.) The southern part of the district has a high aridity index, shorter crop sowing season, and low rainfall probability; the result is that the cultivable area is suitable generally for short-duration pulse crops. Longer duration millets could be cultivated in the northern ecological unit. Population density, livestock species-mix, settlement patterns, and institutional arrangements for resource use and conservation were different in each part of the plot. In the region having higher stress, (i.e., ecological unit number two), the settlements were scattered, population density was lower, the proportion of browsers (in particular, goats) was

higher, and reliance on non-farm activities, (including drafts) was also greater. Interestingly, it appeared that auran had survived more influentially as a mechanism for managing common lands in ecological unit number two.

Other distinctive features of technical and physical attributes of the total plot were as follows:

- The proportion of goats in the total livestock had increased from 16.6 percent in 1951 to 35.6 percent in 1971; cattle and sheep had declined over the same period from 32.1 percent and 45.0 percent to 22.5 percent and 36.1 percent, respectively (CAZRI 1982).
- The fodder deficit during the same period was estimated to have increased from 44 percent to 55 percent (Gupta 1984b).
- The population of cattle, buffalo, sheep, and goats had changed between 1951 and 1971 by 7.96, 17.3, 23.39, and 229.89 percent, respectively. The dynamics of degradation thus were reflected in the changed species-mix of livestock. Goats were much more widely distributed amongst economic classes and ecological regions than were sheep, which were restricted more to the poor in the arid west (Gupta 1984b).

Formal decision-making arrangements were based on complex processes and requirements as described below. A member of a sheep and pasture development project was required to be a resident of the village where the project operated and had to be a sheep breeder. His written application had to be approved by the majority of the management committee, and he should purchase at least one share. No one would be admitted who had been convicted on any criminal charge (per the provision of Rajasthan Cooperative Society Act and Rules). A preference was to be given to small, marginal farmers and agricultural laborers (for example, sheep owners who would like to purchase equity with specified livestock). A guaranteed return of 25 percent was assured to every shareholder. Individual members provided a sheep in lieu of the share capital so that they would have greater attachment to the project. The sheep and wool department of the state government had appointed stockmen at each plot to take care of the health of the animals and to protect against unauthorized intrusions. Although each plot was fenced

with barbed wire, it was not uncommon to find the fence broken.

The president of the management committee of the pasture plot was one of the richest persons in the area. The members of his family owned about 25 percent of the total land and 45 percent of the cultivable land. They also had the most livestock, and a very high proportion of cattle. All of the good tube wells in the village belonged to this family (a total of six). The president of the sheep and pasture development society was also the village head-man, vice president of the dairy cooperative, and exercised influence over almost every other social activity. He belonged to the Rajput caste, which, although not the leading caste in sheep production, dominates the panchayat.

In the beginning, the "advance" team (organized by the department of sheep and wool development) was to try to persuade people (particularly those who owned sheep and goats) of the advantage of developing common land into pastures through cooperative societies. But in the push to launch the project and under political pressure from the Rajputs, the major objective of having the poorest shepherds form societies and nominate their management committee was sacrificed. Moreover, the project failed to consider that access to the common lands differs on the basis of social class. The land closest to the village was selected, although it was not representative of the worst parts of the common lands.

The management group, composed of three government representatives and four members of the society, was supposed to be representative of and accountable to all the members, yet most members could not explain anything about the actual decision-making processes or how they received income from the sale of their grass seed, sheep, and wool.

Many of those who were eligible to become members did not even know about the society when it was started, and others were skeptical about the benefits of participating in such a small project: even if the plot could carry 400 sheep belonging to 34 members, it could only deal with a fraction of the total problem. In fact, the village did not agree to fence the common land through collective decision making. The political dominance of the panchayat by the Rajputs ensured that the plot would be established in spite of opposition.

The plot should have been handed over to the people after four years of operation--that should have been in

1982--but it continued to be managed by the department, who feared the total disintegration of the plot.

The fence had been intact in the earlier years, but had broken down at several places over the life of the project. Several explanations were put forward:

- Many people in the village were upset because they had not been included in the cooperative society but felt they deserved to be included.
- The two watchmen posted at the plot could not effectively guard the 100-hectare plots.
- Since the plot was located just next to the village, the farmers who had their fields on the other side of the plot had to take much longer routes to reach their fields. They felt that they did not gain anything by cooperating and protecting the fence.
- Some people said that before the plot was fenced everybody grazed their animals on the common lands, but once the plot was developed, the benefits accrued only to the members.

It is difficult to isolate the contribution each factor made to the deterioration of the fence. It is important to note that most of the plots where fences remained intact were located in the ecological unit number two, where environmental stresses were higher.

The pattern of interaction can be studied by first determining the relative importance of livestock and land in the household enterprises of different classes. The households having more land than animals would have different perceptions of the benefits and costs of cooperating to preserve the commons than would those with the opposite situation. The landed class, in view of its access to fodder from private land, did not feel vulnerable even if the commons were degraded. On the other hand, those whose wealth lay in livestock found that the commons provided a very small share of their total grazing requirements. The lack of cooperation to protect the commons thus emerged for different reasons; this is one aspect of the tragedy of the commons that remains understudied.

It is also important to note that successive droughts in this region, coupled with excessive grazing (even if in the short run) have effected changes in the successional profile of biomass. During monsoon, such species as Tephrosia spp., Indigofera spp., Crotalaria spp., Cyperus

spp., and Cenchrus biflorus suppress the development of perennial species. Many of these species are of very low nutritive value, and being annual, leave soil bare and subject to wind erosion for the greater part of the year (Jodhpur Team 1980). The implication is that once the degradation has reached a particular level, mere conservation or restraint would be insufficient to provide the necessary regeneration of perennial and desirable grass species; a technological change--seeding proper species--would be required. Therefore, management of such commons must not merely reinforce controlled grazing but should also devise a strategy for sharing the costs of instituting technological change. Often, these costs have been borne partly or fully by the state. However, in providing these funds, the state failed to assure that (1) alternative sources of fodder and water would be available during the stress period, and (2) the value added through government investment and supply of restraint would be shared equitably among different classes and not merely in proportion to respective stocks as is often done.

In contrast to these formal decision-making arrangements and patterns of interaction, the traditional approaches to managing auran land invoked religion and moral sanctions to effect the desirable collective behavior. These sanctions could not be questioned while the rules of the game were evolving.

Pasture plots unquestionably resulted in increased grass cover and in conservation of water in the underground tanks. But the costs of conservation were very high--the iron fencing was expensive, and the project required a heavy investment of manpower to supervise the arrangement. As a consequence, the project, and hence its benefits, are difficult to replicate.

During the past decade, only a fraction of the total land has been conserved by this arrangement, and wherever management has actually been handed over to the people, the fence has broken down. The basic question of equity--reasonable and fair return to respective contributions--could be answered with a statement from Oakerson (1986): "Indeed the presence of inequity may lead to the collapse of collective efforts, resulting in inefficiency. The equity problems are exacerbated by assymmetries among users, creating opportunities for some to benefit at others' expenses."

The basic purpose of 100-hectare sheep and pasture plots was "to demonstrate [to] the farmers how the

carrying capacity of the existing degraded land could be increased by adopting scientific methods and utilizing the moisture for longer periods, thus increasing the productivity of [the] same lands substantially....[as well as] to demonstrate...[that] adopting sheep husbandry practice [could] increase the income without...any further [investment]" (Jodhpur Team, n.d.)

Indeed, if the purpose of these plots (and other extension measures) was to demonstrate that restricted grazing would lead to increased grass cover, one must acknowledge that the project succeeded admirably well. However, the fact that auran land in many villages was not only better conserved, but still had much denser growth of trees, bushes and grass, should have provided the same demonstration. Thus, the appropriate question for the sheep and wool department to address should have been: "why did traditional decision-making arrangements generate diverse outcomes like protected auran land in some villages and degraded common lands in other villages?" Yet, such a question was neither explicitly raised nor implicitly answered. Instead, it was assumed that people in arid regions did not know the advantage of restricted grazing.

There also remained a case for improving veterinary practice and enhancing the common lands (with better grass seeds), both of which would have reduced sheep mortality. But in a system already as iniquitous as this one, and one that had no mechanism for keeping disparities in check, technological changes that improve returns on existing investments (in this case, sheep) only widen the gap between "haves" and "have nots." The uncertainties leading to individually optimal but collectively sub-optimal outcomes were not reduced. The official review of the pasture and sheep development program acknowledged some of these problems:*

- o "In the village there is a tough competition between cattle versus sheep for grazing. Because of lower socioeconomic status of the sheep breeders, most of the grazing facilities in the community grazing lands are utilized by the cattle

*It is obvious that the conflict that was finally recognized after 10 years of project operation could have been anticipated from the beginning, yet neither the World Bank report (in 1974) on the subject nor any other evaluation except by the author (Gupta 1981) noticed the conflict so as to modify the project design.

breeders for their cattle and buffaloes. Sheep population is forced to the rocky and most unproductive areas and the Gochars and other productive pastures are allotted to them after they have been consumed by the cattle. In such a situation, it is very difficult to teach the whole of the village people to offer their community grazing land patches...[as] sheep pastures (only for a particular society's livestock)." (Jodhpur Team n.d.)

- The total production on the 100-hectare plots was very low and could not sustain a large number of animals. Further, because of low rainfall and longer periods of dry spell, the establishment of perennials posed serious problems.
- In whichever case, the plots had a better grass cover compared with the adjoining community lands, but the fences were broken and frequent conflicts ensued between owners of plots and villagers.
- As a result of frequent droughts, unpalatable shrubs (like Tephrosia) have come to dominate the plots and further reduced the grazing potential.
- Because the government was not sure whether it wanted to continue the scheme (or even expand it with modifications), members of the society were reluctant to use their sheep as share capital on the plot.
- Management problems, already severe, were exacerbated because the village extension workers in charge of the plots were often transferred.

The initial phases of establishing the pasture plots were often marked by resistance from the villages (so much so that in some cases the fencing had to be abandoned even after the pillars were erected), yet no effort was made to study the farmers' response systematically. This project suffered from a typical development problem: technical solutions were offered for what were basically institutional difficulties; not surprisingly, such pilot projects have never been replicated.

Using Oakerson's framework to analyze the lack of congruence between the physical and technical resources and the decision-making arrangements, we can see how counterproductive patterns of interaction led to undesirable outcomes. Even more disturbing is the fact that the national grazing policy (Ministry of Agriculture 1984)

evidences no appreciation for the potential conflicts inherent in any strategy to manage common property.

The report of the Task Force to Study all Aspects of Grazing and Fodder to Evolve a National Grazing Policy includes the familiar recommendations (Ministry of Agriculture 1984):

- The number of livestock should be reduced and unproductive animals should be replaced with productive animals so that the land use plan could be developed for both community and waste land. In the scarcity-prone areas, arrangements should be made for maintaining fodder banks.
- Migration of livestock should be stopped; the herdsman should be held responsible for any damage caused to the agricultural fields and various plantations.
- Nomadic tribes should be permanently settled.
- People should be encouraged to adopt the system of stall feeding.
- The panchayats should take responsibility for ensuring rotational grazing on common lands.
- Regional fodder depots should be established.
- Critical areas (e.g., the catchments of major rivers) should be closed to grazing.
- Sheep and goats should be prohibited in the forest areas.
- Extension programs should be initiated to inculcate public awareness leading to cooperation.

These suggestions do not incorporate any attempt to understand and address conflicts that have arisen from historic inequities in the pattern of resource ownership and their implications for the management of the commons. It has been assumed that the landless communities, faced with the degraded commons, irrationally concentrated on raising sheep and goats because these animals require less fodder than do cattle or buffalo. Yet the landless were also confronted with two other problems: the intensified use of private cultivated lands by the landed communities (which reduced their access to private fallows) and the increasing price of dry fodder. It may be that raising sheep and goats was entirely sensible under the circumstances.

The problem of degradation of commons should not be considered in isolation of changes in private lands or in the variations in the availability of dry fodder. A dry

fodder market has emerged in the few years consequent to the large-scale efforts to encourage livestock development in nontraditional irrigated cash crop regions. As a result, dry fodder has moved from one place to another, thus restricting local supplies, particularly in drought years, and intensifying the pressures on the commons. Recent government efforts to encourage afforestation by closing the roadsides or other areas where moisture retention may be higher has further increased the demand for commons use.

FUTURE OPTIONS

Basically, four parameters influence the extent to which any value-adding cooperative enterprise will generate socially desirable outcomes:

- The proportion of value addition that is used as dividend, replacement cost, maintenance fund, and most importantly, risk fund to ensure the risks that poor people take when they pool in the enterprise.
- The share of value addition that is used to diversify the resource management strategy so that the skills or resources of the poor members of the cooperative are used in higher proportion.
- The extent to which the transfer pricing arrangement is used to reduce the income disparities (by charging, for example, higher prices for the same services--e.g., veterinary services--to wealthy members and lower prices to the poor members). It may be added here that the differential pricing of services is easier than is differentially pricing the various inputs.
- To the extent to which the pooling is independent of redistribution.

It must be appreciated that in any state intervention, the case for pricing mechanisms that bias the outcomes of the intervention in favor of the poor are justified by constitutional obligations in most developing countries. These obligations are embodied in the socialistic objectives to which many developing countries have subscribed. It must also be noted that market forces will always try to intensify the inequities in a manner in which the resource-use options would invariably be different for

different classes of producers. Finally, if the development of common lands is intended to expand the decision-making horizon of the poor and to constrict or equalize the influence of the wealthy, then one cannot belittle the role of assurance mechanisms as argued by Runge (this volume). Given the class conflict in the rural society, these assurances would work only if different rations of assurance were properly accorded to different sections of the society, and the supply of restraint expected from these classes were specified.

These assurances must take cognizance of the varying levels of risk in different resource markets. The same risk phenomenon is subjectively perceived as being different by different classes of users of a resource depending upon their access to institutions and their historical experiences with the way the state and market forces respond to scarcity. Thus, different classes will require different degrees of assurance before they will invest in a common property resource. Classes that are less vulnerable to deprivations resulting from a degraded commons may need only minimal assurance about their future returns from restrained exploitation. On the other hand, the classes that are more vulnerable will want assurance of alternative means of subsistence in the short run and and high degrees of long-term assurance about sustained supply of resources from the common property. It is our contention that the kinds of institutional innovations that would provide these different degrees of assurance likely will not come about through the play of market forces alone; positive state action that draws upon the principles of traditional resource management very likely will be necessary; clearly, the institutional arrangements in this case did not in any way provide disproportionally higher returns to the poor landless shepherds.

Because the reasons for noncooperation by the poor and by the rich are different, it is important that one take into account the implication of these differences for any institutional solution. Using a multi-market socio-ecological framework with proper recognition of historic inequities in resource use might sharpen the Oakerson framework in such a way that new and viable options could be discovered.[1]

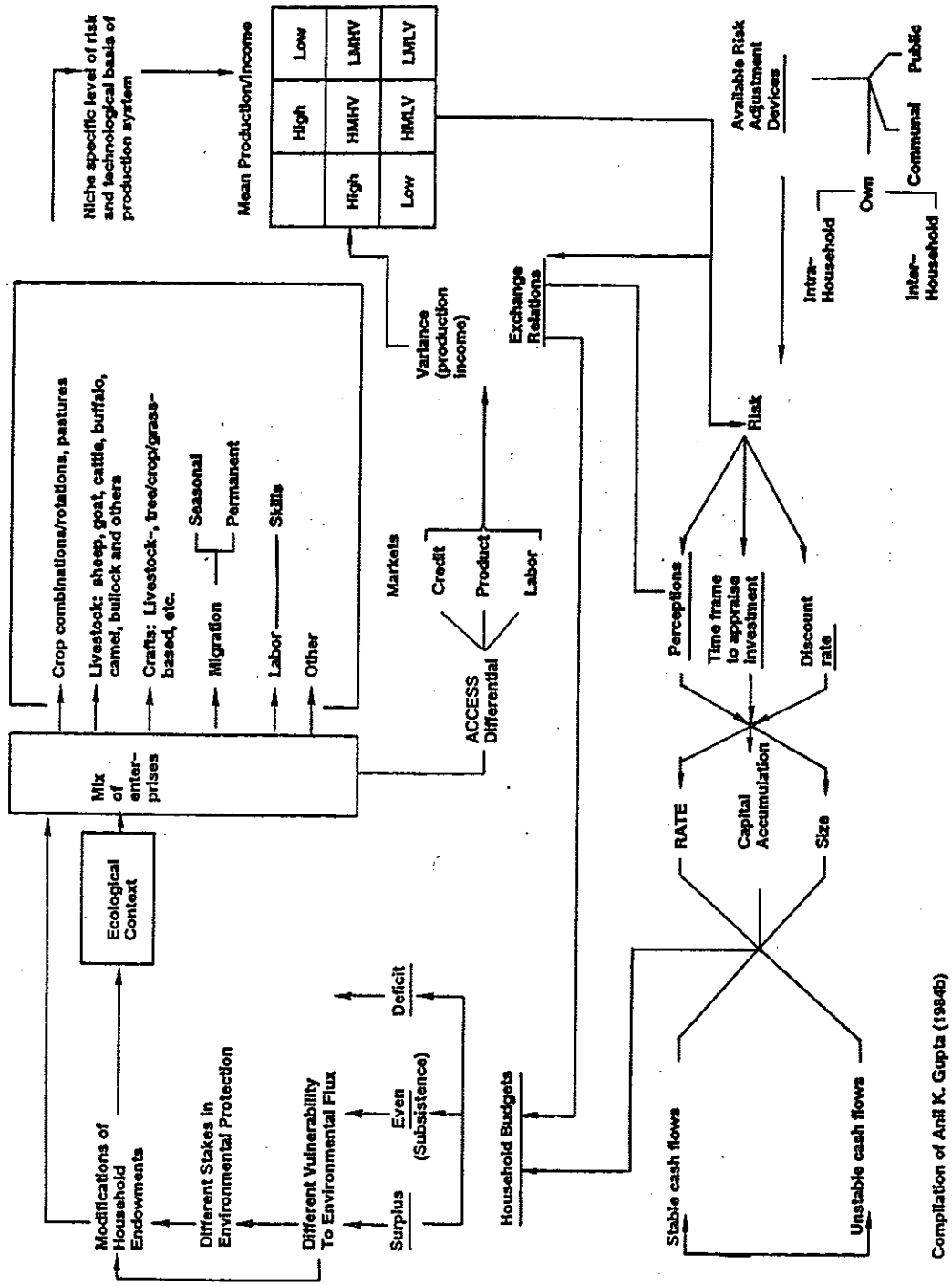

FIGURE 1 Socioecological framework for analyzing household economy.

NOTE

1. The theoretical implications of various aspects of common property management are briefly discussed in a separate paper (Gupta 1985). Managing common properties: some issues in institutional design. The concept of scarcity, role of redundancy in rule making, and the role of state vis-à-vis assurance mechanism are discussed.

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