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Rationality, Representation, and the Risk Mediating Characteristics of a Karakoram Mountain Farming System

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Despite emerging appreciations of contextual knowledge systems, elements of diversity in mountain farming systems are often characterized as irrational and as obstacles to achieving the production goals of 'modernized' agriculture. In this paper, I suggest that these negative representations are produced at least in part as a function of the normalization of a large-scale agriculture as rational. A case-study of a mountain farming system in the Karakoram mountains of northern Pakistan is presented to expose a contextual rationality in relation to risk minimization and to challenge characterizations of this system as 'backward,' unsophisticated and irrational. Specifically I examine the risk mediating characteristics of practices such as field dispersal, delayed planting, intercropping, and polyvarietal planting and conclude that the characteristic feature of this local farming system is a contextually rational diversity. This conflicts with the modernist paradigm of rationality and economic growth subscribed to by a local development agency. Intervention based on ill-informed interpretations of "traditional" practice have the potential to increase vulnerability of villagers by failing to appreciate the contextual rationality of diversity.

KEY WORDS: agro-ecology; development; Karakoram; Pakistan; risk.

INTRODUCTION

The prevalence of diversity in so-called "traditional" mountain farming systems is often represented as arational by exogenous interests, such as development agents, who choose to intervene in such systems. I believe this to be a flawed representation which results in the concep-

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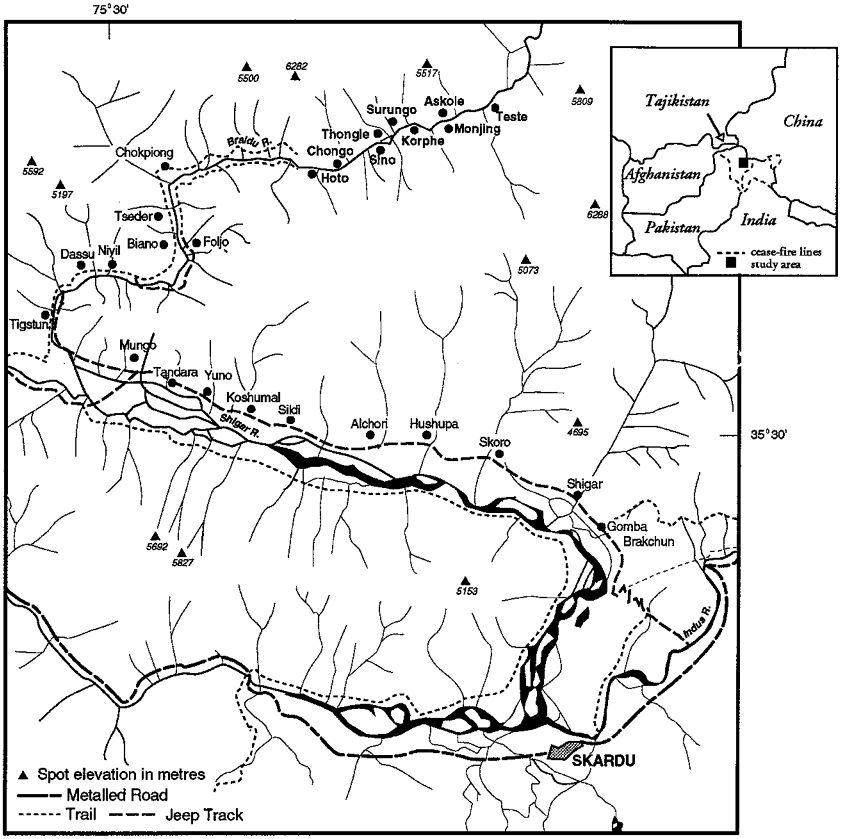

Fig. 1. The Indus, Shigar and Braldu Valleys, Baltistan.

tualization of local systems and practices as static and resistant to change; as largely anachronistic. In part, these representations are a consequence of a popular dominant view which typifies inhabited mountain regions as isolated, temporally stationary, refuge areas (Boehm, 1984, Bishop, 1989). In a recent review of "mountain hazards," Hewitt (1992, p. 57), for example, notes that from the vantage point of this dominant view

> human agency appears, at best, as unconscious, an ignorant or helpless accomplice. This is especially easy with remoter mountain lands and cultures. Whether treated critically or romantically they commonly emerge as prisoners of an overwhelming environment, backward in economy; archaic, conservative, and superstitious in culture; having a geography but no history, incapable of effectively adapting to their setting or capable of knowing their way to improvement.

In this paper, I examine elements of a general pattern of diversity in the farming system of Askole, a Karakoram mountain community in the Baltistan region of northern Pakistan (Fig. 1), and argue that such diversity is a contextually rational response to local environmental conditions as it acts to reduce environmental risk and minimize the vulnerability of local villagers. The main point that I make in this paper is that both intentionally and unintentionally, as part of "normal," "everyday" agricultural production, the farming system of Askole possesses an adaptive flexibility and a rational diversity which can accommodate risk; but that this is not recognized by contemporary development agents who persist in interpreting and characterizing "traditional" farming systems as irrational and in acting on the basis of that interpretation.

The paper is divided into three main sections. I begin by historically contextualizing negative representations of a traditional agricultural system in Baltistan and arguing that such negative representations are used to legitimate contemporary development interventions. The second section discusses the agro-ecological system in one Karakoram village, characterizing it as a set of contextually rational practices which serve to minimize environmental risk and vulnerability to subsistence crises. In the final section, I suggest that the intervention of development agencies, whose representations of "traditional" farming systems as irrational is consistent with a modernist paradigm of rationality and economic growth, has the potential to increase vulnerability as they avoid engaging with a culturally and ecologically sensitive appreciation of local context.

REPRESENTATION, RATIONALITY AND DEVELOPMENT

Representations, as they are reified through institutionally sanctioned processes, produce a knowledge of people and place and make them "susceptible to certain kinds of management" (Breckenridge and van der Veer, 1993; p. 6). In the case of northern Pakistan for example, Butz (1996) has identified a set of representations of people and place that resonate from colonial narratives through to the contemporary reports of development agencies. These include characterizations of place as harsh, inhospitable, barren, and unproductive, and of people as "incapable stewards" of the natural environment, of lacking intelligence, and of being unable to overcome environmental constraints and survive in their own habitat (Butz 1993, 1996; MacDonald 1994, 1996a, forthcoming). It is this "knowledge" that is often used to justify and legitimate intervention in the form of "development" activities, activities meant to overcome the inabilities and repair the inefficiencies or irrationalities that many take to be naturalized within indigenous or "traditional" agro-ecological systems (cf. Ferguson, 1990, Sachs, 1992, Hobart, 1993).

These representations, however, have not been coherent and consistent through time. In relation to so-called "traditional" farming systems, for example, the representation of "remote" or "developing" societies as inept is relatively recent and emerged in accordance with European colonialism and the rapid intensification and mechanization of "Western" agriculture in the late nineteenth and twentieth centuries. In the case of Baltistan, as in many others, representations of people and their practices as irrational have a very specific discursive genealogy that is tied to colonial narratives, but the configuration of this discourse underwent a marked change in relation to alterations in the mode of production, control over the means of production, and production objectives in European agriculture. In the late nineteenth century, for example, the agricultural capacity of "the Balti villager" was initially represented in favorable terms by "Western" colonial travellers. This was not a region that was merely "scratching a living" from the soil, but one in which crops "flourished." Baltis were represented by more than one European observer as the "best farmers" in the northwest Himalaya (Ujfalvy, 1896, p. 314; cf. Vigne, 1844, Drew, 1877, Knight, 1895, Duncan, 1906, Crowley, 1969). Even though attitudes toward villagers during this period were grounded in Orientalist and racist ideologies, specific agricultural achievements often merited cautious praise: "The semi-barbarous Himalayan valley-dwellers, who in their habits are but little above their domestic animals, are experts in the art of irrigation . . ." (Workman and Workman, 1908, p. 13).

The emergence of negative characterizations of traditional farming systems in Baltistan corresponded with the growth of capitalist mechanized agriculture in the "West" and a growing recognition, and religiocentric disapproval, of the collective basis of social organization and agriculture in Karakoram communities. Walter Asboe (1947), a Moravian missionary working in Ladakh, for example, reported that ". . . any idea of agricultural progress is strangled at birth by the tyrannical communal conscience, which is contented to remain *in statu quo* as regards agricultural pursuits" [original emphasis]. He attributes the nature of this perceived permanence to some inherent characteristic of the society which prohibited change:

> . . . [it] seems unlikely that there will occur any such thing as agrarian agitation for better conditions of life for many centuries to come, for the customs of centuries and the usages practiced from time immemorial have become so ingrained in the general make-up of the people that a new way of life is repugnant to them. (p. 187)

From this, and other similar comments, emerges the image of a conservative system, one that is resistant to change, if not static. Within this image, practices are assigned a character of obstinate permanence, not because they are seen by the local people to work and to meet their goals and needs (i.e., rational), but simply because they are "ingrained." This is typical of the reification to which Hewitt (1992) indirectly refers when he discusses the dominant view of human agency as an ignorant or helpless accomplice in dealing with risk and hazard in mountain lands. Other travellers to the Karakoram maintained views similar to Asboe's (e.g., Heber and Heber, 1926, Barrett and Barrett, 1928, Schomberg, 1936, Hashmatullah Khan, 1939, Young, 1939, Clark, 1956, Hurley, 1961, Stephens, 1966, Afridi, 1988). Through these representations, villagers became characterized as conservative, backward, resistant to change, and their practices and economies fell prey to the same criticisms.

Unfortunately, such representations often form the impetus or starting point for development agencies and their associated projects which seek to redress and overcome these perceived "constraints to development." Ultimately, the "backwardness" of "tradition" is assigned in relation to some "forwardness" or progression of intensive, mechanized, market-oriented Western agriculture which, in turn, is defined and supported by a vast administration and bureaucracy, and is geared toward production objectives of yield and profit maximization. From this viewpoint, farming systems which utilize simple but locally effective technologies and which do not share "modern" production objectives are viewed as backward or as "un"-something—unmodern, undeveloped, unimproved—as temporally stationary, sitting far back on the imaginal continuum of stages of development; essentially, as irrational (*cf.* Clastres, 1987, pp. 49–51).

In general, much of the operative farming system in Askole can be interpreted in terms of intentional and unintentional means of mediating acceptable levels of environmental risk. In the remainder of this paper I examine agro-ecological practices which act to minimize risk and argue that these reflect the existence of a contextual rationality which is manifest in the social, spatial, and ecological configuration of production. This discussion is not meant to be functionalist *per se*, but, as Watts (1983, p. 113) has argued along similar lines, although the assumption of a universal rationality such as risk reduction in essentially corporate communities is open to criticism,

> . . . in a society in which for most households the object of production [is] the reproduction of the conditions necessary for family [or household] consumption, a risk-averse utility surface at low income levels is a useful and valid heuristic device.

Under the general rubric of risk mediation, then, I consider not only the risk-minimizing nature of specific agricultural practices, but more importantly, the role of diversification in mediating levels of risk and vulnerability within the agricultural system. In doing so, the exposure of what I describe as a contextual rationality in agro-ecological practice, challenges those representations that typify the local farming system and practice as backward, unsophisticated, and irrational.

METHOD

Most of the primary observations presented in this paper stem from fieldwork conducted in the village of Askole and other villages of the upper Braldu valley between July 1989 and November 1990. During most of this period, I was engaged in a participant-observation study of risk and vulnerability. This study had several immediate objectives: (a) to examine human–environmental relations, social organization and social structure in order to identify means by which risk is mediated and vulnerability minimized; (b) to evaluate how these means are maintained and reproduced through village institutions; and (c) to provide a benchmark for evaluating the longitudinal impacts of development and modernization on village institutions. In this study I adopted a pluralist research approach which combined participant observation with more so-called "objective" methods such as field mapping and geophysical sampling. It also combined open-ended, nondirective, flexibly structured interviews with the administration of a socio-economic survey of 42 households which revealed information on household demographics, agronomy, trade, and general economic activities.

Although the sources and methods used in this study, as in any other, have their limitations, much of information presented here would have been difficult to collect in any other way. A long period of residence in the village allowed data to be validated and cross-checked with other sources of information. The accuracy of responses could also be assessed, and possible anomalies explained through cross-referencing of information from a variety of sources including direct observation and local knowledge gained from living in the village.

AGRICULTURAL ECOLOGY IN THE UPPER BRALDU VALLEY OF NORTHERN PAKISTAN

The village of Askole is the uppermost settlement in the Braldu valley of Baltistan region of northern Pakistan. With 42 households and a 1990

Fig. 2. The Upper Braldu Valley. Villages in the upper Braldu are located on terrace fans near the valley floor. The debris-covered tongue of the Biafo glacier is in the foreground.

population of 364, it is one of ten villages in the upper Braldu valley that are unified by social ties and a common material culture that has largely disappeared from much of the rest of Baltistan. Until recently, largely due to the absence of road access and their distance, 2 days travel, from the regional market town of Skardu, they have been relatively isolated from much of the modernization and development occurring in many Karakoram communities. The economy of the upper Braldu is still primarily based on subsistence agriculture with production occurring on terraced fields near the valley floor (below 3500 masl) and through vertical transhumance to pastures in high elevation glacial valleys (3500–5000 masl) (Fig. 2). Al-

Fig. 3. The nucleated structure of Askole village is typical of all upper Braldu villages. Note the physical situation of village fields. Land is lost near the toe of the fan through the erosive force of the river and lost under mass movement deposits near the rockwall to the north.

Table I. The Spatial Organization of Agriculture in Askole Expressed as Zones of Cultivation[a]

Characteristics	Zone I	Zone II	Zone III	Zone IV
Distance from village	0 m	0–500 m	500–1000 m	> 1000 m
Soil classification	*Maljing*	*Maljing* ranging to *Barsud* near edge of zone	Mostly *Das* some *Barsud*	*Das*
Topography	built up village, gently sloping	uniform, gently sloping, (≈5°) terrain	hummocky terrain, moderate slope, ≈5-15°	flat to rolling terrain, various slopes, 0-15°
Field descriptions	small kitchen garden plots (*druma*) and woodlots (*tsarr*), usually wailed against predators and adjacent or near to house	relatively large terrace fields with sloping grassed banks	very small terrace fields supported by vertical rock walls	largely uncultivated, some abandoned flat fields on river terrace
Vegetation	mixed garden vegetables, mostly root crops such as carrots (*wonphlu*) and potato (*aloo*), and some herbs	intensive mixed cropping of wheat (*tro*), buckwheat (*blo, hrgyamis*), turnips (*mulu*), and peas (*stama*), Forage grasses (*hrstwa*) on terrace banks and on a few small plots at margins of zone	extensive mixed cropping of *tro, blo, hrgyamis* and *hrstwa*, separated by uncultivated patches of rocky ground, spradic tsarr and lone trees (*staagi*) and sea buckthorn thicket (*tshok*)	barren ground with little vegetation. Sporadic occurrences of scrub vegetation such as artemesia (*burtsai*)
Management practices	• irrigated • heavily manured with human waste and random poultry droppings • unweeded • intercropping	• irrigated • heavily manured with livestock and human waste; no use of chemical fertilizer • regular crop rotation • seasonal weeding • intensive polycultural and polyvarietal intercropping regular inspection of crop • condition regular daily and nightly • guarding from livestock and predators pre- and post-harvest	• irrigated • lightly or unmanured, annual application of chemical fertilizer • no crop rotation little • weeding • little polycultural intercropping • no regular inspection of crop condition • only daily guarding from livestock and predators • livestock sheds placed in fields to minimize transport distance of manure and fodder	• no regular management • seasonal collection of *bartsai* for use as fuel • pooling of spring water for bathing • periodic grazing of livestock

[a]These zones are not truly concentric and distances expressed convey the general pattern of production.

though local men have worked as porters for mountaineering expeditions over the past century, agriculture remains the primary occupation of all village households.

Cropped land is held privately within the household, whereas grazing land is held as a village commons with equal access granted to all village households. Production, distribution, and consumption occur largely within the extended family group and there is little exchange of produce with the regional market economy. The household is the basic productive and social unit in the village. While large extended households are seen as the ideal type, the actual distribution of household types in the village ranges from single nuclear families to four generation joint extended family households. Average household size is 8.8 members. Outside of the household, lineage allegiances are quite strong in the village, and the nucleated order of settlement supports strong social and economic relationships on the basis of neighborhood and kin allegiances (Fig. 3). While the household is the primary social unit, individual households also belong to one of five clans in the village. As land is held within the extended household rather than individually, and all village households own land, landlessness is virtually absent in the Braldu valley.

The upper Braldu is a single cropping zone and has, in regionally comparative terms, a short growing season of approximately 140 days. The climate, like much of the Karakoram is arid, with average growing season precipitation of 30 mm. Consequently, production is completely dependant on irrigation derived from high altitude snow and ice melt. The short growing season leads to a significant problem with late spring and early autumnal frosts and also causes potential inequalities in the seasonal distribution of water. Other frequently recurring damaging events affecting Askole include wind storms, crop diseases, and epidemics. Despite these constraints and despite the pronouncements of interventionist agencies such as the World Bank and the Aga Khan Rural Support Program (AKRSP) that the area is marginal for agriculture, farmers consistently attain high yields and agronomists have noted the high production potential of the area (Whiteman, 1985, 1988). Within these physical limits and opportunities, cultivation in Askole occurs on contiguous, terrace fields which support a crop base of wheat, buckwheat, peas, turnips, forage grasses, and, on a smaller scale, garden vegetables. Wheat, the mainstay crop, is grown in a two-to-one year rotation with buckwheat or peas. Crop production is supplemented by the rearing of livestock, primarily chickens, sheep, goats, cattle, yak, and dzo (a yak-cattle hybrid). These are used mainly for their produce (dairy and wool), and meat is consumed only on special occasions.

In local taxonomic terms, land (*tsa*) is divided into three basic categories; *maljing*; *barsud*; and *das*. These are not directly classified by subjective interpretations of soil color, texture or moisture-holding capacity, but on the distance of fields from the village (Table I). *Maljing* (resting fields) refers to land near the village which is intensively cultivated, but requires little effort, due to its proximity to the village, to maintain its productive status. It is described as *hong-bu* (very deep) and requires less manure and irrigation than fields further from the village. *Das* designates fields on the margins of cultivation. These are characterized as quite shallow (*shal shal*) with a thin soil layer overlying a stony subsoil and are said to require more frequent irrigations indicating a poor moisture retention capacity. *Barsud* soils represent a transition from *maljing* to *das* and are found between the two zones with accordant transitional characteristics.

This classification recognizes the transitory nature of the quality of soil derived from a uniform parent material and developed *in situ*. Under relatively uniform conditions, soil and land classification are a function of both the spatial pattern of settlement and the temporal and spatial development of agricultural production. Given the nucleated settlement form of Askole, fields closest to the village have the longest history of cultivation and, accordingly, have received the greatest input of organics from manure, crop residues, and irrigation water (Table I). This has a direct impact on soil structure so that *maljing* fields demonstrate strongly developed structural characteristics while *das* fields have a weakly developed soil structure (MacDonald, 1994). Villagers add that the original settlement site was established adjacent to land considered well-suited to immediate cultivation, and irrigation water was brought to this site rather than locating the village closer to the water source. The development of soil profiles suitable for agriculture has followed the progressive cultivation of fields outward from the village center.

STRATEGIES OF DIVERSIFICATION IN A "MIXED MOUNTAIN FARMING SYSTEM"

Agricultural production in Askole, then, displays the characteristics of what has been called a "mixed mountain farming system," the general diversity of which is essentially oriented toward risk-reduction (e.g., Rhoades, 1986). The temporal and spatial distribution of both crop and livestock production exploits and redistributes the risk of failure over a range of ecological zones providing a diversified economic base. Within both of these primary spheres of production, polycultures are maintained which are based upon a diversity of species. Indeed, polyculture is often seen as a traditional strategy that promotes diet diversity, yield stability, reduced insect and disease incidence, the efficient use of labor, the intensification of production

Table II. Selected Risk Mediating Agro-Ecological Practices in Askole

Crop production
- Dispersed land holdings
- Agro-pastoralism with mixed cropping
- Heterogeneous cropping landscape
- Intercropping
- Polyvarietal planting of staple crop including an early variety
- Delayed planting of short-duration secondary crop
- Crop rotation
- Erosion reduction
  —terracing of slope
  —division of fields into irrigation beds
  —planting of vegetation in gullies
  —construction of step terraces in gullies
  —field reclamation techniques
- Coordinated experimentation with new innovations and planting material

Livestock production
- Species diversity
- Vertical transhuman cycles
- Spatial dispersal of pastures
- Communal tenure of pastures
- Flexible supervision of livestock at pasture
- Coordinated movement of collective village herds and flocks
- Herd size limited by ability to stall feed animals
- Collective labor arrangements
  —voluntary work groups
  —communal work groups
  —stock associateships
  —threshing partnerships

with limited resources, and the maximization of returns under low levels of technology (Altieri, 1987, Liebmann, 1987). The following sections discuss specific practices of this farming system which provide diversification and result in a risk-minimizing heterogeneous surface of production for all village households (Table II). Such diversification is particularly manifest in the spatial distribution of land holdings in Askole.

Dispersed Land Holdings

Given the quality-based division of land in Askole, the potential differentiation in the quality of land held by individual households is quite serious. However, any inequalities that might stem from household lands being held in contiguous parcels are offset by a dominant pattern of field dispersal. All village households own a number of disparate plots scattered across the surface of the terrace fan, and these collective holdings of dispersed fields act to ensure that no individual household has disproportionate land holdings concentrated on good quality land near the village (i.e., *maljing* fields) or, conversely, on poorer quality marginal land (*das* fields)

Table III. Degree of Land Fragmentation by Farm Size

Farm class[a]	Number of farms	Total amount of land	Mean farm size	Mean plot size	Mean number of plots	Mean Januszewski's index[b]
. 5–1 ha	5	3.65	.73	.10	7.6	.38
1–1.5 ha	9	10.9	1.21	.12	10.1	.33
1.5–2 ha	8	13.98	1.75	.17	11.4	.32
2–2.5 ha	6	13.01	2.17	.22	12.3	.32
> 2.5 ha	4	14.5	3.61	.19	20.8	.25

[a]Farm size includes only cropped land. This figure does not include vacant land, wood lots, and under fodder grass which are worked less intensively.
[b]The square root of the total cropped area, divided by the sum of the square roots of the plot sizes. Fragmentation increases as the vale approaches zero. A single plot farm has a value of one.

(Table III; see Bentley, 1990, on measures of land fragmentation). Arable land in Askole is concentrated within an area of about 120 hectares and private land holdings are comparatively small. Collective holdings in villages households usually amount to less than 5 ha of land dispersed over an average of 12 plots. These plots are commonly between 0.1–0.2 ha for wheat and buckwheat and .05–0.1 ha for peas. This pattern of dispersed land holdings effectively minimizes the vulnerability of individual households by distributing the risk of damage to fields and crops over the largest possible area of productive space. Notably, this pattern of field fragmentation also applies to collective clan holdings in Askole, as no one clan controls disproportionately large land holdings in any one cultivated block.

Of course, there are drawbacks to having fields dispersed over a wide area, particularly the time and labor costs involved in tending scattered fields. Living in a nucleated settlement, villagers must travel out to their fields during the day and return to the village in the evening. In Askole, however, travel time from the village to the outermost fields is approximately 60 minutes for a round trip, perhaps 75 minutes with a load, and although the distance of fields from the village does influence management practice, it does not seriously inhibit crop production.

Field dispersal has been observed in many mountain societies and is usually discussed in terms of verticality, or the exploitation of several crop zones over a range of elevations (Netting, 1972, 1981, Friedl, 1974, Rhoades and Thompson, 1975, Brush, 1977, Guillet, 1983, Orlove and Guillet, 1985, Forman, 1988, Goland, 1993). In Askole, however, the spatial organization of crop production and land tenure varies largely across horizontal space, although when the pastoral component of production is considered, the concept of verticality becomes more relevant. Still, the risk-minimizing characteristics generally attributed to verticality apply here. The primary advantages, relevant to horizontal dispersal across the terrace fan, are the potential to exploit scattered parcels of land of varying quality, microclimate, and topography. This scattering of fields means that the likelihood of all fields and crops being damaged due to any particular hazard such as frost or pest infestation, or from a rockfall or slumping, are significantly reduced. As Orlove and Guillet (1985, p. 7) have noted, " . . . the scattering of fields . . . provides a lower risk of total crop loss than would a pattern having all fields and meadows in a single area." Consequently, the potential of a subsistence or reproductive crisis in any individual household is also significantly reduced through a tenurial system based on fragmented holdings. Indeed, a dominant pattern of spatially fragmented holdings in Askole means that no one household has concentrated land holdings along the rockwall or the cliff margin which bound the fields, or in any of the areas identified by villagers as being particularly vulnerable to frost or wind damage (MacDonald, 1995). In contrast to other Karakoram villages, however, the use of land in Askole does not seem to vary greatly with proximity to potential damage (cf., MacDonald, 1989).

Fragmented land holdings are a characteristic feature of traditional subsistence agriculture (Altieri, 1987). They permit mixed cultivar selection across horizontal space, and, particularly in relation to verticality, are commonly considered to be a functional adaptation or coping strategy (Rhoades and Thompson, 1975, Orlove and Guillet, 1985). The pattern in Askole, however, is more directly related to aspects of social structure and the evolution of a nucleated settlement than to a prescribed risk-minimizing strategy. In Askole, villagers say that historically, fields were opened outward from a central settlement, and were aligned with a primary irrigation channel which brought water to the village. As households evolved, the demand for land increased and new fields were opened along the channel. The temporally successive fields of one household, then, were not necessarily spatially contiguous with other household plots. Rather, through time, a patchwork of household holdings developed along a set of primary, secondary, and tertiary channels. These holdings have since fragmented through partible inheritance, and a variety of other processes including exchange, gift, and sale. Thus, although the spatial structure of land holdings in Askole does present a risk-minimizing surface of production, it is problematic to interpret this as intentional. Villagers realize the benefits and drawbacks of field dispersion, but the land base of Askole offers the potential for a variety of productive patterns and the contemporary form must be seen to derive historically from an interplay of social organization, social relations of production, and environmental constraints upon production (Hecht, 1987).

Indeed, this notion of "unintentionality" is important in the interpretation of practices which act to minimize risk, and, specifically, in discussing a local knowledge of risk mediation, as many practices which can be interpreted as risk minimizing are not necessarily articulated as such by villagers. This is not because the benefits of such practices are not recognized, but because their rationale may well have been lost to time and form part of the "practical knowledge" of the community (Thrift, 1983). In small-scale oral societies and settlements centuries old, adaptive practices developed through a rigorous process of trial and error are retained because they are seen to "work," and become part of the "way of doing things." Hence, they are followed because "that is the way it has always been done," or "it is our way" (Davis, 1982). This is not meant to impart any characteristic of obstinacy to these practices. Rather, they can be, and often are, changed when a better method or "way of doing things" is discovered. But "better" is a term which is defined from within the village, in the context of local norms rather than from without (Richards, 1985, de Boef *et al.*, 1993).

Despite this qualification, these points underline the importance of interpreting vulnerability and the ability to mediate environmental fluctuations which threaten small-scale agricultural communities, such as Askole, in the context of prevailing ecological conditions. However, persistent and historic forms of social organization and social relations of production must also be considered in such interpretations. For it is within this context that farming systems evolve, based upon the ensurance of subsistence and the minimization of risk (Richards, 1985, Bennett, 1986, Turner and Brush, 1987).

Delayed Planting

It is within the dispersed spatial distribution of land holdings that the general diversity of a mixed agropastoral farming system has developed in Askole; a farming system which is essentially oriented toward risk reduction. A characteristic of many traditional farming systems is the ability to adjust to environmental fluctuations. This resiliency derives, in part, from crop diversity, and the staggered planting that multiple cropping permits. In Askole, this allows villagers to effectively respond to a capricious seasonality by growing early-maturing buckwheat as a secondary, rotational, crop to wheat. Notably, the common practice of planting buckwheat later than wheat provides farmers with the ability to adjust to any anticipated shortfall in mainstay wheat production. Although buckwheat could be planted simultaneously with wheat, planting is delayed by approximately 1 month. By this time, wheat has germinated, the threat of a late spring frost has largely passed, and the success of the planting can be assessed. Sufficient buckwheat seed is kept in reserve to replant wheat fields with faster-maturing buckwheat if necessary, and if not, the planting of buckwheat proceeds as usual. This practice is not without a measure of risk as delaying the planting of buckwheat increases the probability of damage from an early fall frost. Given average climatic conditions, however, buckwheat matures within 70–90 days and is ready for harvest well before the first autumn frost. Crop diversity and risk spreading are also enhanced by growing two varieties of buckwheat (*rgyamis*, sp. *Fagopyrum sagittatum*; and *blo*, sp. *F. tatricum*) even though these are not intercropped.

Intercropping

A second adaptive practice which tends to minimize the risk of total crop failure, and one which is common to pre-modern farming, is intercropping. Intercropping has been defined in a variety of ways by agro-ecologists (e.g., Risch, 1983, Richards, 1985, Liebmann, 1987, Vandermeer, 1989, Altieri, 1991) but is used here to mean the intentional, simultaneous growing of different species or varieties in the same field. In Askole, intercropping takes two primary forms. One is the dominant practice of intercropping buckwheat and turnips. This intercrop serves a number of purposes, related primarily to the reduction of labor requirements, and the minimization of the risk of total crop loss. Aside from the "breakcrop" benefits of pest and disease reduction of growing buckwheat and turnips in rotation with wheat (Altieri, 1983), the dual leaf canopy which emerges from this mix tends to impede the vertical movement of pests. As Vandermeer (1989, p. 96) has observed "when an intercrop [such as turnip] breaks up the normally sharp distinction between host plant [such as buckwheat] and soil, [pests such as] aphids are less efficient at locating their hosts." It is notable buckwheat is particularly attractive to aphids (Mitchell and Dean, 1978), and the only pests seen in Askole fields, and described to me by *Askolepong*, were aphids. These pests, along with frost and wind, are recognized by villagers as one of the three main problems affecting their crops. The turnip intercrop also acts as a smother crop, reducing the intensity of weeds, and the broad leaf canopy of turnip shades the soil from incident radiation, hence reducing evaporation and conserving soil moisture. As this intercrop mix is usually planted on *maljing* fields, it also contributes to the discursive characterization of such lands as having good moisture retention capacity.

These effects minimize demands on labor and agree with one of Vandermeer's (1989) criteria for practising intercropping—the efficiency of labor management. By intercropping turnips and buckwheat, and using both as rotation crops, the labour required for manuring, weeding and irrigating a large land area is minimized, and becomes available for other tasks. Similarly, as the demand for manure and irrigation water is reduced, the intercrop minimizes the need for labor-intensive inputs. Vandermeer's (1989) second criterion, that of a yield advantage, or at least no disadvantage, is equally important in Askole. In part, villagers see the role of intercropping as one of yield stability. *Askolepong* make the general observation that when buckwheat produces poorly, turnips do well and when turnips perform poorly, the buckwheat crop does well. This local experience agrees with Liebmann's (1987, p. 118) general observation that "yield compensation may occur between polyculture component crops [intercrops], so that failure of one component due to drought, pests or other factors might be offset by increased yield by the other component(s)."

In Askole, the primary compensatory benefit of the intercrop is a reduction in the risk of total crop failure due to frost. While buckwheat is particularly vulnerable to frost damage through seed shatter, turnips are frost resistant. The yield advantage of the intercrop, then, becomes apparent in the case of an early frost when the loss of buckwheat is high. When compared with the potential loss of a sole crop of buckwheat, those households which intercrop with turnip retain at least some food supply from the land area that was devoted to the production of buckwheat. In this case, then, farmers seem willing to forego the possibly higher yields of a sole cropping in favor of gaining a measure of security provided by the intercrop. Again, this balance is common in subsistence-oriented farming systems where risk reduction and the maintenance of food security seem to be at least as important as maximizing potential yield returns (Hecht, 1987, Liebmann, 1987, Gallant, 1989, International Movement for Ecological Agriculture, 1990, Altieri, 1991).

The second dominant intercrop mix in Askole occurs within single plot monocultures of wheat, the staple crop of the village. Though monocultures are often seen as inherently risky, much research ignores the practice of polyvarietal plantings within specific monocultures, and their role in increasing genetic diversity and mitigating the risks and hazards entailed in monoculture farming (Morren and Hyndman, 1987). In Askole, three different varieties of wheat are planted together in single plots. This polyvarietal planting mimics the advantages of, and functions much the same as, polycultural intercropping. Polyvarietal planting can reduce the onset of specific diseases, reduce the spread of disease-carrying spores and modify local environmental conditions so that they are less favorable to the spread of certain diseases (Altieri, 1987, Vandermeer, 1989). Furthermore, as pests and diseases are often variety specific, their diffusion within plots is inhibited by the random distribution of different varieties of wheat. This diversity offers several sources of resistance which can act simultaneously to reduce losses due to pests and diseases and significantly reduce the risk of total crop loss. Specific characteristics of the cultivars themselves also minimize the risk of loss from other hazards such as frost. One of the Askole cultivars (*nastro*), for example, matures approximately 20–30 days earlier than the other varieties. Thus, in the event of an early frost before full maturation, at least a portion of the crop is harvestable as foodstuff. Richards (1985, p. 69), in discussing the benefits of intercropping varieties with differing maturation periods, notes that a "better uptake of plant nutrients and soil moisture is . . . achieved where a quick and a slow-maturing variety of the same crop . . . are planted together, because the two varieties put major demands on resources at different times." This characteristic of early-maturation, along with its long spikelets, gives *nastro* its name. *Nas* is the local name for an early-maturing barley which is no longer grown in the village.

Again, this mixed planting of varieties with different growing season requirements is not unique to this area, but is more commonly reported in humid rice-growing regions where polyvarietal planting is used as an adjustment to variations in flood levels (Richards, 1985, 1986, Karan, 1987, Morren and Hyndman, 1987, Rasid and Paul, 1987). In the case of mountain farming, however, Rhoades (1986, p. 42) echoes the observations of most of these researchers when he notes that mixtures of many native crop varieties are grown ". . . as a way to 'spread out' risks, as each variety responds differently to disease, insects or climate," and that "farmers guard against total crop loss by maintaining variety."

Surface Configuration and the Reduction of Erosion

Aside from the spatial arrangement of crops within fields, and specific planting strategies, diversity in the surface configuration of cropped land in Askole displays risk-mediating characteristics. The dominant practice of edging terraced fields with grassed slopes, rather than relying completely on stone retaining walls, contributes to a heterogeneous cropping landscape (Altieri, 1983). These grassed banks act as a barrier, or at least a buffer, between fields, thus inhibiting the mobility of herbivores and reducing the impact of pest infestations (Vandermeer, 1989). The practice of growing leguminous plants adjacent to cropped fields has also been shown to inhibit the colonization, feeding, and reproduction of specialized pests, and to promote the natural enemies of some pests (Mayse, 1983, Altieri, 1987).

As with many other cultural practices, however, it is difficult to present the reduction of risk as the sole or primary function of grassed terrace banks. Such banks, for example, also act to retain soil and reduce terrace erosion (Ahmad, 1991, Thomas and Biamah, 1991). The grass grown on these banks also provides an annual supply of winter fodder. Suffice it to say that reducing the risk of pest damage is *one* result of this practice, and could well be a deciding factor in making it the dominant practice. Alternatives to terrace banks, for example, are known and used in Askole but only in specific circumstances. Terrace walls are used in some fields and the advantages to crops from the diurnal storage and release of heat, and the increase in level land, are known to farmers. But the more widespread use of retaining walls would eliminate, or at least reduce, the barrier effect provided by grassed banks. It would also increase the labor demand for field maintenance, as terrace walls often require seasonal repair. Consequently, terrace walls are only found in specific topographic situations, such as ravines, where the need to check erosion and contain the flow of water demand their use (Fig. 4).

Aside from grassed terrace banks, a number of strategies exist in Askole to combat problems of erosion and mass wasting. Again, a diversity of such practices serve numerous functions which are difficult to prioritize. Stubble left on harvested fields, for example, accommodates free-grazing and contributes to the nutrient cycle, but it also inhibits aeolian erosion in the fall when bare fields are particularly susceptible to extremely strong valley winds.

By far the most significant erosive problem in Askole, however, is the formation of gullies created, in part, by residual irrigation water which cuts channels down the face of the fan toe. Erosion in these gullies is intensified by the action of the Braldu river which continually removes material from the base of the fan. There are, however, well-defined strategies for dealing with this potential loss of land which attempt to stabilize gullies by progressively colonizing them with vegetation and cultivated fields. Vegetation, specifically sea buckthorn (sp., *hippophae rhamnoides*) and trees, is planted in gullies and exploits the residual irrigation water which creates the channel. The root systems of this vegetation, along with colonizing grasses, also help to bind soil particles, thus strengthening the soil and inhibiting soil dislodgement and removal which contribute to the growth of the gully (Haigh, 1984). Despite private ownership of these gullies, villagers rarely harvest the trees or shrubs they have planted and take steps to protect them from grazing livestock. Where possible, crop land, which has been damaged or lost as gullies have enlarged over time, is reclaimed through terracing. The construction of terraces modifies the slope topography, controls surface water flow, restricts gully headcut advance, permits vegetation

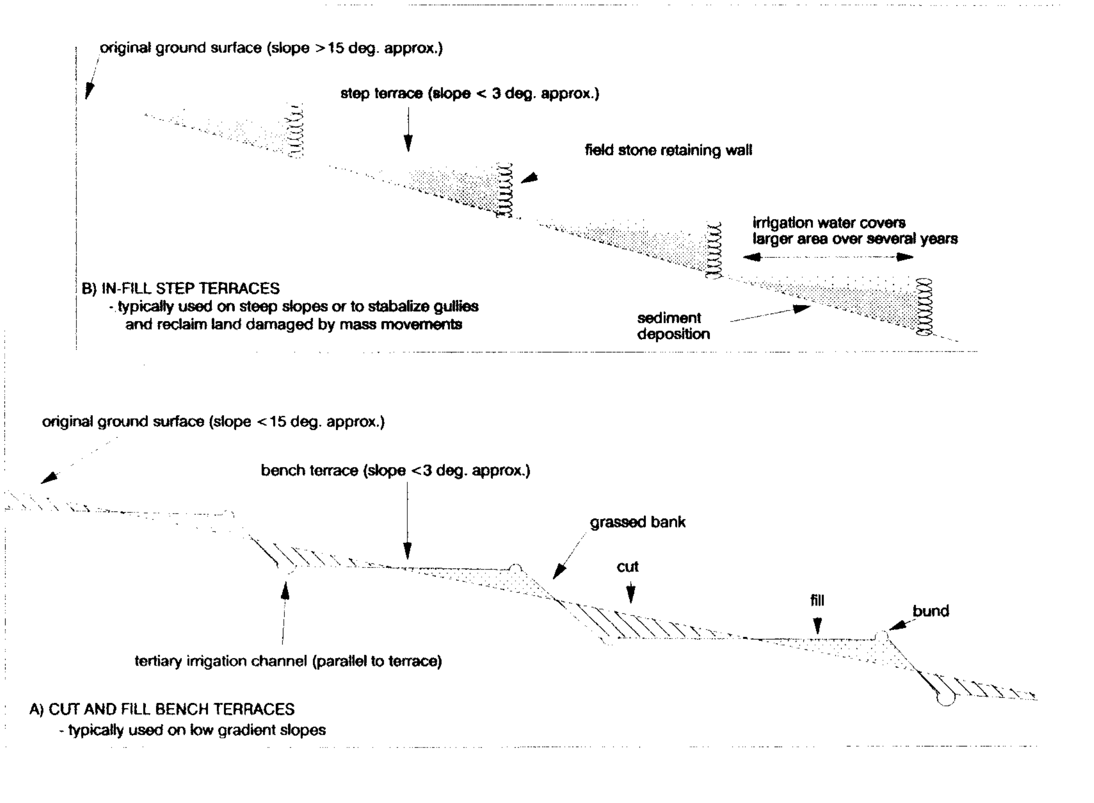

Fig. 4. Two techniques of slope modification through terrace construction in Askole fields.

regeneration, and stabilizes the gully, reducing the potential for further land loss (Johnson *et al.*, 1982, Haigh, 1984).

The benefits of slope stabilization provided by these strategies are not unimportant as problems of hillside erosion and mass movements pose a significant risk to mountain and hillslope agriculture (see Ives and Messerli, 1981, 1989, Haigh, 1982, 1984, Valdiya, 1985, Messerli *et al.*, 1988, MacDonald, 1989, Moldenhauer *et al.*, 1991). Although they frequently go unnoticed, numerous mountain communities have developed strategies to minimize the degree and damaging effects of erosion, and to reclaim land that has been damaged by mass wasting. Askole is no exception, and reclamation strategies in this village demonstrate that, whereas actual damage usually occurs quite rapidly, response is a long-term, ongoing process of adjustment rather then an immediate reaction. This temporal dimension of response, manifest in everyday practices which act to minimize the degree of damage from erosive forces, is one explanation for a popular conception of an inability of mountain dwellers to cope with these forces. An understanding which would overcome this popular view, however, requires *in situ* long-term observation of indigenous practices which is rarely accorded these communities prior to, let alone following, a hazardous event (cf. Waddell, 1975, 1983, Chambers, 1981, 1983, Johnson *et al.*, 1982, Stack, 1982, Bjøness, 1986, Ives, 1987, MacDonald, 1989).

The actual techniques of reclamation demonstrate an intricate knowledge of local environmental conditions and represent the accumulated practical knowledge of centuries of habitation in this specific setting. *Askolepong* recognize that the development of a fertile productive soil base requires several years of accumulated alluvium and organic inputs, and reclamation efforts reflect this knowledge. When rockfalls or gullies cause major damage to holdings, the initial response is to construct or reconstruct a terrace wall. Stone walls are built in series up the slope and essentially act as check dams to pond water and collect deposited sediment. If soil is available in the immediate vicinity (e.g., from gully side walls) it is used to till in the area behind the walls. In any case, the area behind terrace walls is flooded during regular irrigation cyclings and, over time, a base of fine-grained alluvium accumulates. This is complemented with the seasonal addition of manure. Once an incipient soil base has accumulated, grass and weeds are permitted to colonize the terrace. These build soil strength, improve the nutrient status of the soil and are allowed to grow for at least three years prior to planting a crop on the reclaimed terrace. By local estimates, the time period from beginning the reclamation effort to recropping a suitable field is approximately 8 years.

In addition to those specific response practices discussed above, continual efforts to maintain and repair terraces and degraded land can be seen as an "everyday" passive approach to risk management and the protection of vulnerable land. Not surprisingly, farmers differ in their commitment to protecting such land, but community norms and sanctions tend to enforce property standards so that no one household is disadvantaged by the self-interested actions of another.

Diversity in Livestock Production

Much of the above discussion has focused on specific risk-reducing practices and patterns related to crop production and the mobilization of labor which mediate threats to that production. Not surprisingly, practices related to the livestock component of Askole's economy also display significant risk-reducing characteristics. As with crop production, most of these relate to diversity which is particularly manifest in the selection of animal species raised by *Askolepong*. By rearing a mix of animals, villagers are able to procure a variety of livestock products with differing nutritional and utilitarian value. They are also able to limit the risk of the total loss of a significant economic asset due to illness or disease. This is particularly important as numerous *Askolepong* invest any surplus crop production or earned cash in livestock and use livestock as a convertible asset during periods of crisis or low food supply. In essence, for many households, livestock represent their life savings and they maintain a low measure of risk by diversifying their investment (Table IV).

In relation to the use of livestock as an investment, *Askolepong* attempt to maximize herd size within limits defined by the ability to stall feed their animals. Such access to a large number of animals acts as a precaution

Table IV. Distribution of Livestock Holdings of Askole Households, 1990

	No. of households owning										
		Goats		Sheep		Cattle		Dzo		Yak	
No. of animals owned	Chickens	M	F	M	F	M	F	M	F	M	F
0–2	1	19	8	20	10	39	32	18	31	32	22
3–5	6	15	15	10	11	2	9	22	9	7	10
6–10	14	5	7	7	11	1	1	–	8	2	4
11–20	13	1	10	2	5	–	–	2	–	1	5
21–50	4	2	2	3	5	–	–	–	–	–	1
> 50	4	–	–	–	–	–	–	–	–	–	–
Total No. of animals owned	874	229	385	295	375	25	76	142	66	84	212

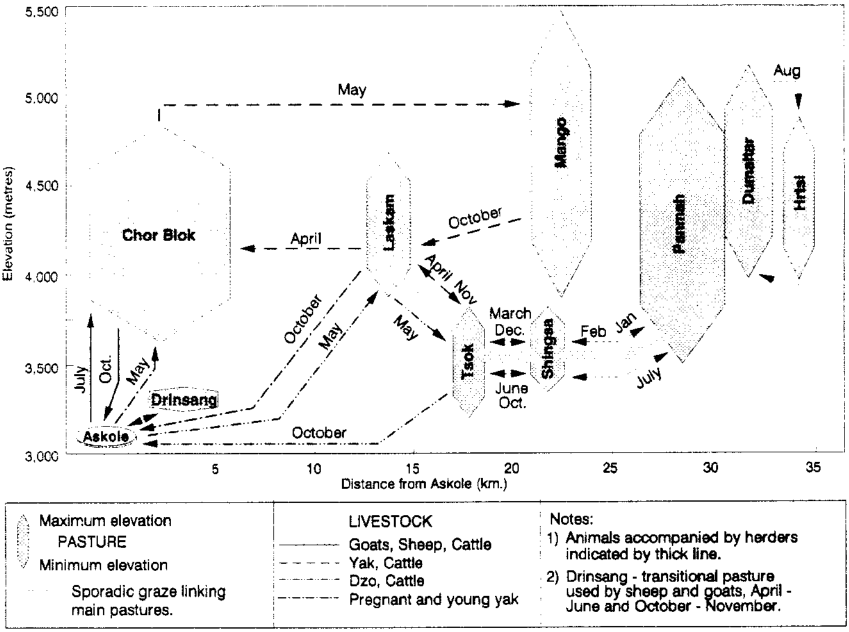

Fig. 5. The trashumance cycle of Askole showing the seasonal migration of livestock to and from the village. Note that Askole yak, unlike those of other Karakoram communities, are only semidomesticated and do not return to the village for the winter.

and confers a greater margin of security upon households and localized lineages in the event that they encounter a subsistence crisis and have to divest themselves of all or a portion of their stock. This diversification also permits the exploitation of several different altitudinal ecological niches on both a daily and a seasonal basis (Fig. 5). This exploitation provides livestock with an adequate food supply, not available in the village, and, consequently, promotes the reproduction of the herd (Metz, 1990). The reproduction of the herd is also safeguarded by the use of spatially dispersed pastures (Fig. 6). If all village livestock were concentrated in one pasture near the village, a situation of overgrazing would result and the carrying capacity of that pasture would soon be exceeded. Thus, in Askole, the spatial regulation of grazing which disperses livestock also serves to disperse the effects of grazing, protect vulnerable areas, and secure a regenerative food supply (Brower, 1990). This spatial separation of livestock species also acts to minimize the impact of any particular hazardous event such as a landslide, rockfall, or predation by wildlife. Much like field fragmentation, farmers protect their investment by spreading it over a wide geographical area with differing ecological conditions (Fig. 7).

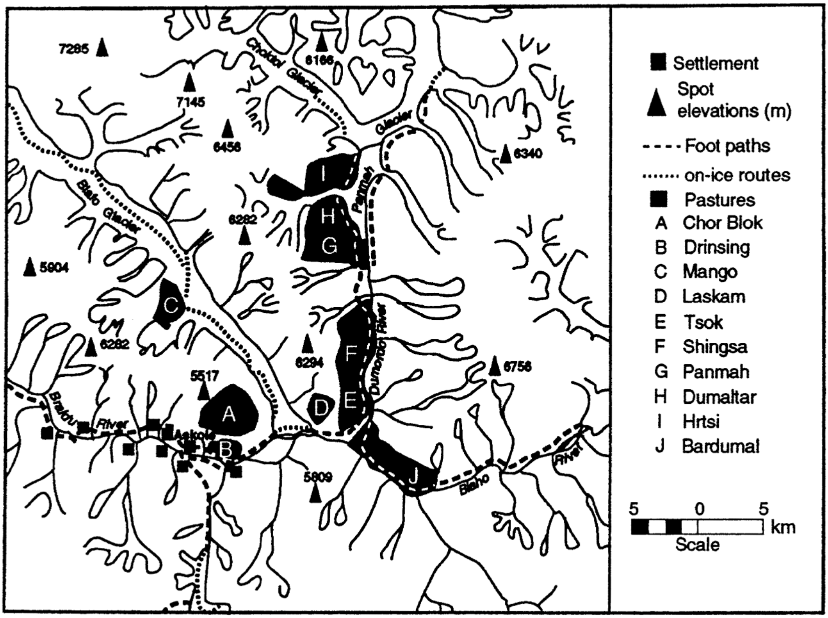

Fig. 6. Location of Askole pastures.

The ability to protect this investment and equitably reduce risk among all village households is also a function of the communal ownership of pasture lands. While cropped land is privately owned by individual households, grazing land is held as a village commons. This diversification of tenure reduces the vulnerability of village households by providing equitable access to all, and contributes to the maintenance of the village as a viable unit by eliminating the potential dominance of vested or outside interests (cf. Rhoades and Thompson, 1975, Netting, 1994).

Cooperative Work Groups—Diversification in the Mobilization of Labor

While to this point I have focused on ecological practices and community norms that support them, an important risk minimizing element of Askole's farming system is a diversity in the mobilization of labour. Whereas everyday fieldwork is commonly the responsibility of individual households, a variety of normatively appropriate labor arrangements in Askole permit some households to overcome the limits and constraints placed on their ability to respond to hazard by a lack of labor. These provide the ability to overcome seasonal bottlenecks for the village as a whole and periodic bottlenecks for individual households (MacDonald, 1996a).

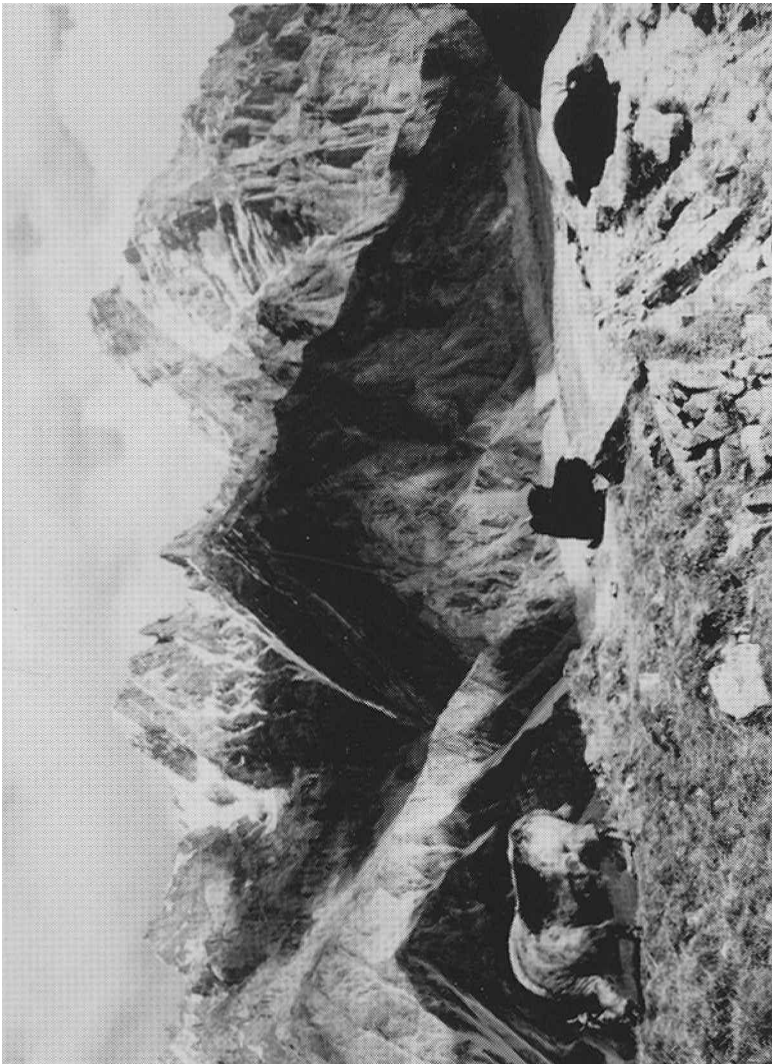

Fig. 7. Yak at Mango pasture (5000 masl). A humid climate, winter snow accumulation and the control of spring water maintain good grazing conditions at high altitude pastures. Askole pastures are spread over a wide geographical area with differing ecological conditions.

At the village level, communal work groups are responsible for the maintenance and protection of common property and village resources. All village households are expected to contribute either labor power or material support to these groups (MacDonald, 1996a, cf., Netting, 1994). In contrast, voluntary work groups operate in an *ad hoc* fashion and come together as they are required by any specific household. These exist apart from and supplement the work of communal labor groups. Voluntary groups focus strictly on repairs to household lands and buildings. Generally, when a project such as repairing or replacing a roof is anticipated, a household head will ask for assistance from friends and neighbors, and individual households will offer assistance based on the expectation that the same help will be available to them when they require it. No specific account of obligations is kept. In the case of more regular work groups, however, a form of balanced reciprocity endures and work is organized so that any perduring debt is avoided (MacDonald, 1994).

The importance of these co-operative groups, both communal and voluntary, should not be overlooked in a consideration of hazard response, for it is these groups which permit a rapid response to environmental fluctuations. In 1992, for example, extremely heavy rains caused mid-season flooding, and associated debris flows clogged village irrigation channels, damaged many buildings and dwellings, and effectively closed off down-valley transport and communication. In this case, the mobilization of communal work groups allowed irrigation channels to be quickly cleaned and repaired. In addition, the members of undamaged households were able to help others repair their dwellings and free up household labor for fieldwork in order to save the food supply (Hewitt, 1992, K. Hewitt, personal communication). These groups, then, not only serve to ameliorate periodic labor shortages, but are able to curtail the escalation of loss in the event of hazard and allow the village to repair damage and return to a focus on production within a relatively short period of time, without assistance from external agencies. Even if outside agencies were in a position to help, they would find it extremely difficult due to a dependency on roadways and communication routes both of which are commonly the first victims of geophysical hazards in the Karakoram mountains (Ambrayseys *et al.*, 1975, Hewitt, 1976, 1982, 1984, Stack, 1982, Dev, 1983, Davis, 1984, Jones *et al.*, 1984, Nash *et al.*, 1985, Hughes and Nash, 1986, Vuichard and Zimmerman, 1987).

The diversity of labor arrangements also extends to livestock management. Specifically, by forming collective village herds, and relying on formal, village-regulated, and informal, privately negotiated, herding arrangements, farmers are able to minimize commitments of time and resources required by their stock. Not only do such arrangements lessen the labor burden on any particular household, but they build and strengthen social ties among those households which participate in a stock group. It is these social ties, developed through "stock associateship," which can act as a hedge mechanism and increase a household's recuperative power through the activation of reciprocity claims in the event of, or in anticipation of, a stock loss or subsistence crisis (Watts, 1983, p. 118).

Such organized herding arrangements also facilitate and regulate the seasonal movement of livestock to and from the village which is coordinated temporally with the stage of fieldwork in the village. Individuals cannot bring their own livestock down to the village apart from the collective village herd. This coordination not only limits the potential damage to crops standing in the fields, but tends to equalize the risk of damage for all village households. All are equally protected from free-grazing livestock and no one household has a specific seasonal advantage over any other, regardless of the amount of land owned or the household labor supply. Also, as threshing is accomplished through cross-household partnerships and the sharing of draught animals, all households must be at the same stage of fieldwork for it to proceed. In cases where specific households are seen to be falling behind the seasonal labor schedule, and thus increasing the vulnerability of the village collective to late fall frosts or early winter snows, they are prodded by peer pressure and by *yul hltumpong* (village guardians) to complete their harvest.

CONCLUDING REMARKS

What I have described in the preceding discussion is a fairly conventional "traditional" mountain farming system that is, in the main, oriented toward the minimization of risk. Part of this risk mediation is manifest in practices which represent flexible adjustments to specific, known, and identifiable risks. Other practices, such as the spatial dispersion of fields, can only indirectly be brought under the guise of strategy. It is difficult to argue, however, that any particular component of this farming system represents a specific response to a specific, anticipated or unanticipated environmental event, such as a landslide, wind storm, frost, or pest infestation. Regardless, the system can be interpreted using risk mediation as a heuristic device for, as I have emphasized above, it is diversity which is the key to minimizing risk and reducing vulnerability in this community. Diversity of crops and stock, and dispersal of land all act to spread or distribute risk and leave something in reserve in the event of a calamity. In the end, the goals of production, and, hence, the farming system, are ultimately concerned with how people survive and how social reproduction is ensured within fundamental environmental conditions. Netting (1981, p. 57) views these goals as simple and direct: "how people get enough to eat, clothing and shelter to protect them from the elements, . . . and sufficient stored goods to see them through a bad year or two."

Rather than being a determinant of agricultural form and technique, however, these environmental conditions merely frame any number of possibilities which are given form over time through practiced human ingenuity. The land use, technologies, and farming practices which do emerge as part of a farming system represent, in part, a longitudinal adjustment to cultural and environmental conditions which include "known" and "expected" risks. In Askole, they are evaluated and dealt with as an integral part of the environment, from within the totality of a farming system which embodies a detailed practical knowledge of the local environment, and views the environmental conditions affecting production not as distinct elements, but as a whole. Thus, as part of this whole view, risk and hazard are integrated into a locally cohesive and coherent system of land use and management which gives form to the productive landscape. Similarly, means of "coping" or "dealing" with risk and hazards, primarily through spatial and biological diversity, are inseparable from routine practices which continually manipulate and productively manage the local environment. Paraphrasing Hewitt (1992), human agency is *not* an ignorant or helpless accomplice in mountain environments and it is in the ways discussed above that villagers *are* capable of effectively adapting to their setting and *are* capable of knowing their own way to improvement.

Despite the contextual rationality apparent in the diversity of practices outlined above, an interpretation of "traditional" mountain farming systems as static and resistant to change persists within development agencies in northern Pakistan, as elsewhere. This representation is consistent with a modernist paradigm of rationality and economic growth, which tends to see the diversity of "traditional" agro-ecological systems as a hindrance to the objectives of conventional development. Of course, it is a misconception that traditional farming systems are inherently resistant to change and several practices observed in Askole belie this impression of static permanence. Indeed, these observations indicate that the local farming system is quite dynamic and that farmers are more than willing to experiment with new material and technologies which they actively seek out. Again this is not unique to the case of Askole, and a great deal of recent work suggests that adjustment within these systems is based on a process which includes the discovery or introduction of an innovation, field trials, and adoption, modified adoption, or rejection (cf. Brokensha *et al.*, 1980, Richards, 1985, 1986, MacDonald, 1994). Thus, innovation and "development" are not dialectically opposed to tradition but are inextricably bound to traditional behavior. Indeed, Tabboni (1988, pp. 228–231) has argued that “a continuous and functional relationship exists between tradition and innovative behaviour” and that tradition is a necessary foundation of social production, reproduction and societal “progress”:

> the presence of a tradition . . . provides the basis around which to build an opposition and an alternative project . . . every society must solve the problem of how to find new forms for what has been useful, for what should be saved . . . .

This observation frames an explanation of the process of innovation in Askole. And it is through this process that the characterizing feature of the farming system of Askole has emerged—a contextually rational diversity. By contextually rational I mean that *appropriate* action or practice is defined in the context of a knowledge of what is required to maintain local biological *and* social reproduction; and the appropriateness of that knowledge is decided by a cultural rationality which judges its acceptability (Cohen, 1993). This knowledge is not simply reflective of conditions at a given moment or place, but is also historically contingent, is reliant on tradition. But like so much of local practice involved in traditional farming systems, the pattern of diversity that results from contextually rational practice has come to be represented as irrational, as an obstacle to attaining development objectives.

A salient example of such a conflict exists in the case of the Aga Khan Rural Support Programme (AKRSP), a nongovernmental organization committed to the articulation of Karakoram communities with regional, national and international economies (Khan and Khan, 1992, Kreutzmann, 1993). Here, the risk-minimizing goals of rational diversity manifest in local agro-ecological practices are ignored by AKRSP officials who view such practices as inhibitive and partially responsible for low levels of adoption of “improved” practices introduced into the area (Hussain, 1987). For example, in an attempt to explain the low levels of adoption of allegedly high yielding wheat varieties they note that “. . . there is circumstantial evidence that the improved varieties have lost their yield advantage over time, as their seed quality has deteriorated due to mixing with other varieties. Most fields had [a] significantly mixed stand” (Hussain, 1987, p. 20). The implicit assumption here is that most farmers share a common goal with the AKRSP in seeking a yield advantage, but that they have failed to do so because they persist in traditional practices. However, while farmers would undoubtedly be happy to experience increased yields, these must occur within a farming system which is concerned as much with minimizing the risk of total food loss as it is with maximizing yields. While the farming system that exists in Askole has emerged in accordance with a set of human–environment relations that make it difficult if not impossible to prioritize single goals, the practice of polyvarietal planting and intercropping, along with the explanations provided by farmers for following these practices, indicate a general priority of minimizing risk over maximizing yield or profit. None of this is to say that yields cannot or should not be increased, but that any increase is likely to have significant costs which may well come in the form of reduced diversity. The potential reduction or elimination of this diversity is itself not without consequences, primarily in the form of an associated increased risk of food loss. Morren and Hyndmann (1987, p. 308), for example, note that a loss of biological variability usually occurs with the wholesale adoption of one or two modern hybrid varieties which replace a "multitude of long-established or traditional nonhybrid varieties." Although potentially producing higher yields on an annual basis, these new hybrids often require production inputs not available to most small-scale farmers and are frequently ill-suited to local growing conditions or storage requirements (Chambers, 1983, Redclift, 1984, Hecht, 1987). Indeed, when yields are examined longitudinally, total yields per hectare under polyculture are often higher than sole-crop yields, even when yields of individual components are reduced (Altieri, 1987, 1991, Liebmann, 1987, Vandermeer, 1989).

This is not a new observation and is supported with numerous historical examples which reveal a long trend toward the homogeneity of production, usually the end-point in a set of responses to the economic marginalization of rural populations (e.g., Poffenberaer and Zurbuchen, 1980, Rambo, 1982, Leaf, 1983, Regan, 1983). This reduction in crop diversity and the disruption of traditional practices have effectively removed food security from local control and increased villagers' dependence on broader market conditions. Unfortunately, much of the development intervention that leads to such disruption is premised on a history of biased representations of "traditional" as an obstruction to apparently rational objectives, rather than a culturally and ecologically sensitive appreciation of local context. The material effect of these representations is uninformed and top-down tampering which has the potential to impair the risk-minimizing capacity of local agro-ecological systems and result in significant social and material damage through inadvertently increasing the vulnerability of villagers to natural and economic hazards. A response to this condition on the part of those who choose to intervene must come from a sceptical approach to prior representation, an understanding of context, and an appreciation of the multiplicity of rationality.

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