"The changing significance of risk in the Mongolian pastoral economy"

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Given the well documented severity and unpredicatability of the Mongolian environment, some authors have reached the apparently contradictory conclusion that the significance of risk to individual households is relatively small. Under collectivisation, the formal redistributive mechanisms and the virtual nation-wide pooling of risk inherant in the socialist system, proved highly effective in reducing risks to individual households. However the transition to the market economy has brought with it the question of who is responsible for risk management; state or individual? This paper argues that certain covariate risks, particularly climatic shocks, represent a case for maintaining the role of the state in risk management and insurance strategies, at least until market institutions and/or social institutions have developed adequate alternative strategies. Using data collected from sixty herding households who suffered losses during the bad winter of 1993, it is shown that poorer households suffered disproportionately. Consequently, it is argued that without the adequate external provision of safety nets, the significance of environmental risks for individual households, particularly poorer ones, is likely to greatly increase.

Introduction

The Mongolian natural environment is one of extremes to which, throughout several transitions in the social and political order, livelihood systems have tried to adapt. The level of danger that severe climatic fluctuations pose to the livelihoods of individual herding households is far from clear. Given the well documented severity and unpredicatability of the Mongolian environment, some authors have reached the apparently contradictory conclusion that the significance of risk to individual households is quite small (Potkanski and Szynkiewicz 1993:67ff). In the pre-socialist period, feudal and religious institutions provided some protection to households. Under collectivisation, the formal redistributive mechanisms and the virtual nation-wide pooling of risk, inherent in the socialist model of the country as a single economic firm, proved highly effective in reducing risks to individual households. However the transition to the market economy raises the question of who is responsible for risk management: state or individual? Although risks to the actual physical survival of the household itself are almost certainly small in comparison with pastoral societies in other continents, this paper argues that certain risks, particularly climatic shocks, are sufficiently severe to justify maintaining a role for the state in risk management, at least until market or social institutions have developed adequate alternatives. It is argued that without such risk management institutions the significance of environmental risks for individual households, particularly poorer ones, is likely to greatly increase. The issue of risk is a key one for government policy in the transition from socialism to some type of market economy in the Mongolian pastoral sector.

In this paper we first develop a framework to analyse pastoral risk, then document the frequency and severity of risks to Mongolian pastoral livelihoods. We analyse the reaction systems through which Mongolian herders protect themselves, or are protected, from the more severe risks. We then consider how the impact of risk is changing and may change during eco-

nomic liberalisation, and what the implications of this are for government policy. We use the case of *dzud*—extreme frozen snow cover, the major winter hazard to herding in much of Mongolia—to illustrate wider questions of risk policy analysis.

Analysis of risk

Two components of risk are important for the discussion here.[1] The first is the frequency, severity and predictability of events damaging to pastoral livelihoods, including for example drought, snowstorms, or market failure; these are the triggers for human disaster. But they do not do this alone. The second component is the reaction system, the state of preparedness, the resilience of households and livelihood systems affected by the trigger event. The two work together to determine the impact of risk: a snowstorm in New York will be much less damaging to individual households than the same snowstorm in a remote Mongolian mountain valley.

Dasgupta (1993) has developed a framework for analysing the extent to which households in a community can insure themselves against risks to income. He suggests that household income can be decomposed into three constituent parts. The first is a time invariant, household specific element, which in the Mongolian context could, for the sake of simplicity, be considered the result of the basic production function of the household. The second and third elements represent modifiers to the first; time varying, household specific shocks (to income) and time varying, community specific shocks. Thus risks to income are divided into two ideal types: shocks which affect individual households (e.g. the loss of workers, non-infectious animal diseases etc.) and shocks which affect entire communities (e.g. drought and other climatic extremes, infectious animal diseases etc.). In this paper we call these 'individual' and 'covariate' risks respectively.

This division oversimplifies reality since many risks can be characterised in both ways, and it is often the geographic spread of a particular risk which determines whether it is individual or covariate. Nevertheless, this provides a basis for understanding the different strategies that are required to insure against these two ideal types. Where risks are not highly correlated between households ('individual' risks), households can engage in strategies which will minimise the impact of a risk should it materialise. This can be achieved either by pooling risk between several households within a community through mutual assistance or reciprocal action arrangements, or by spreading risk between activities within a household by diversifying sources of income (e.g. through keeping several different species of animal). Where shocks affect all members of a community ('covariate' risks) such strategies cannot, by definition, be sufficient as the resources needed by an affected household cannot be provided by another facing a similar crisis. Similarly, risk spreading within a household will be an insufficient insurance strategy if the shock affects all sources of income simultaneously. The inability of households and communities to insure against risks, such as drought, that lead to a high covariance in household income leads Dasgupta to argue that this is the main justification for Governments to be involved in the supply of insurance. In a similar vein, we argue in this paper that household and community mechanisms may reasonably be expected to cope with individual risk, but that government should accept the main responsibility for protecting herding households against covariate risk.

Coping with individual risk

Individual household risk has in the Mongolian pastoral economy been handled in the past, and continues to be handled, in the first place by kin and neighbour assist-

ance. Such assistance is not limited to risk protection, but covers the whole range of needs arising from poverty, distress and danger, including care for orphans, the sick and old people, and helping poor households with food, animals and labour at peak periods. This local assistance has in the past been backed up by the dominant rural economic institutions: the feudal *hushuu* and monasteries before the revolution, and the *negdel* afterwards.

Potkanski and Szynkiewicz (1993) and Potkanski (1994) argue that although immediate serious risk to pastoral households in the past was quite small, in cases of individual household loss of animals or other shock, assistance from kin and neighbours was available immediately, with the *khoshuu* and monastery taking a role if necessary. In fact, monasterial support in such cases was probably as often the result of individual lamas helping their lay kin as intervention by the monastery as an institution. During the *negdel* period, this latter back-up role became fully institutionalised within the *negdel*, and involved a wide range of types of assistance in case of individual emergencies. The broader forms of customary quasi-redistribution (*idesh* and *nair* exchanges, adoption and fictional brotherhood—see Potkanski and Szynkiewicz 1993), although not emergency assistance, also contribute to the creation of general networks of mutual support and reciprocity within the rural economy.

Cooper (1994) documents the way kin and neighbour assistance within *khotails* continues to provide immediate assistance to households in trouble, and to poorer households generally, including loans of food and of animals. Since economic liberalisation started in 1991, the companies which succeeded the *negdels* have in some cases maintained or constituted a charitable fund to offer individual herding households assistance in case of need, and this function is cited by company managers as one of the most important potential roles of the company.

These local mechanisms to contain individual risk continue to operate during liberalisation, although they have been substantially weakened by the dissolution of the *negdels*, which for the last thiry years have been the main back-stopper for such assistance. Such mechanisms could in any case not cope with the much larger demands during periods of geographically widespread or covariate risk. And the impact of the latter has been sharpened and widened by the rapid increase in the number of poor herding households as a result of the liberalisation process so far.

Occurence of covariate risk

In the Mongolian context, Batbuyan *et al.* (1993) have identified the risks facing household production, in the order of importance perceived by herders, as: extreme winter conditions, drought, animal disease, flash flooding, market failure and livestock predation. In terms of the classification used earlier, extreme winter and drought conditions, and market risks, are mainly covariate, the others mainly individual (although animal disease can in some cases be covariate). We focus in this paper on the risks to livestock production resulting from extreme winter conditions, both because it is ranked first by Mongolian herders and also because it is clearly a covariate risk and represents the best case for government intervention. Also, the particularly bad winter of 1992/93, on which some data are available, provides a graphic illustration of the argument of this paper.

Herders include a large number of different hazards within the category of 'extreme winter conditions' and the blanket term *dzud* is often used to describe them. *Dzud* has no direct translation into English although Meserve (1992:225), looking at descriptions of natural calamities in the history of Mongolia, describes it as "an ice covering on all vegetation on the pasture to a thickness that prevented animals from being able to break through the crust and

dig for food, thus starving to death in great numbers". Herders themselves use the term to describe frozen snow cover, deep snow, extreme cold and blizzard conditions, and differentiate between different levels of dzud, describing mild *dzud* as "times when animals cannot reach pasture" and bad *dzud* as times "when everything dies". The *dzud* of 1992/93 is placed in this latter category. Table 1 lists the location and number of livestock lost for all the officially recorded *dzud* since 1944, the worst recorded year this century.

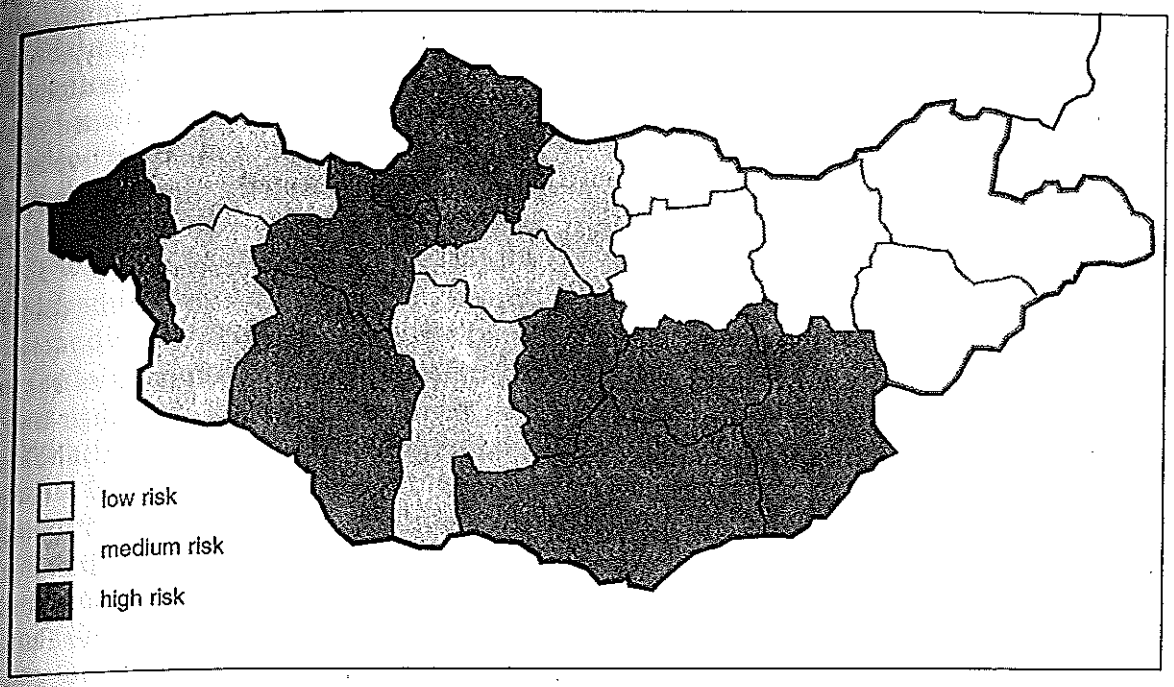
Several comments need to be made on these statistics. First, the loss figures probably underestimate livestock deaths, as they only include losses as a direct result of *dzud*, not deaths resulting from increased vulnerability to disease following *dzud*-related starvation, a factor of some significance (Batbuyan *et al.* 1993). Similarly, loss figures as a percent of the total *aimag* (province) herd may also mislead; losses in the centre of a *dzud* may be more than 50 percent. So although many of the losses look small—a few percent only in many cases—for those herders directly affected they can be catastrophic.[2] Finally, this table lists only risks from *dzud*: herders face many other risks, and the cumulative risk they face is much greater than that from *dzud* alone.

Table 1. *Officially recorded periods of dzud (1944–1993)*

Year	Areas affected	Losses	
		Total (000 head)	As a % of total livestock in area
1944	Whole Country	9000	37%
1946	Arkhangai, Dornogov'	N.A	N.A
1949	Khövsgöl, Ömnögov'	N.A	N.A
1950	Bayan-Ölgii, Övörkhangai, Dornogov'	N.A	N.A
1951	Bayan-Ölgii, Khövsgöl	N.A	N.A
1953	Övörkhangai, Ömnögov', Dornogov'	N.A	N.A
1954	Övörkhangai, Bayan-Ölgii	N.A	N.A
1955	Dornogov', Bulgan	N.A	N.A
1956	Dornogov', Dundgov', Bulgan	N.A	N.A
1957	Khövsgöl, Övörkhangai, Dorngov'	N.A	N.A
1959	Khövsgöl, Bayan-Ölgii, Dornogov', Dundgov'	113	3%
1960	Zavkhan, Övörkhangai, Ömnögov', Dundgov'	192	3%
1961	Ömnögov', Dornogov'	104	6%
1962	Zavkhan, Övörkhangai, Dundgov'	274	6%
1963	Gov-Altai, Bayankhongor, Ömnögov', Dornogov'	362	7%
1964	Zavkhan, Övörkhangai, Ömnögov', Dundgov', Khövsgöl	208	3%
1965	Khövsgöl, Zavkhan, Bulgan	120	3%
1966	Övörkhangai, Dornogov'	100	4%
1967	Uvs, Zavkhan, Sukhbaatar, Khentii, Töv, Arkhangai, Khövsgöl, Dundgov', Gov-Altai, Bayan-Ölgii, Dornogov'	1494	12%
1976	Most of the Country	4100	16%
1983	Gov-Altai, Bayankhongor, Khövsgöl, Bayan-Ölgii	N.A.	N.A.
1986	Uvs, Khovd, Gov-Altai, Zavkhan, Bayan-Ölgii, Arkhangai, Ömnögov', Dundgov', Bayankhongor	800	8%
1987	Khovd, Dornogov', Ömnögov', Dundgov'	N.A.	N.A.
1993	Gov-Altai, Bayankhongor, Zavkhan	753	14%

Sources: Dr. Jidjidsuren, Research Institute of Animal Husbandry, Pers. comm.
Ardiin Erkh (People's Right), National Newspaper, edition of 16/6/93.
MPR (1974) *Statistics of the Rural Economy of the Mongolian People's Republic.*

Figure 1. *Geographic distribution of different levels of risk of freezing snow (dzud)*



With these comments and reservations in mind, Table 2 sorts the provinces affected by *dzud* into three groups: high risk provinces where, during the 50 years for which data are available, a large *dzud* occured on average once in every seven years or more frequently; low risk provinces where such an event took place once in 14 years or less often; and the medium risk provinces between the two extremes. Figure 1 maps these three groups of provinces.

Table 2 and Figure 1 show that the phenomenon of *dzud* is most serious in the mountainous regions of the west and the Gobi steppe and desert regions of the south. The productive and more stable environments of the centre and north east (Selenge, Tuv, Bulgan, Khentii, Sukhbaatar and Dornod) rarely suffer from disastrous winters. National *dzud* disasters, on the scale of that of 1993, have occurred six times in the last fifty years, or about once every eight years.

The common denominator of all forms of winter *dzud* is that they are periods when animals find it difficult to maintain the balance between energy intake and expenditure. *Dzud* can last from a few weeks to the entire winter season. In the best case herders can respond by moving the herd to unaffected areas (winter *otor)* and animals may simply be left considerably weakened. In the worst cases mobility is impossible; animals starve to death, freeze, or are left highly vulnerable to respiratory infections, which quickly kill them. The onset time of a bad *dzud* is frighteningly quick; if animals cannot find alternative sources of food, they start dying only two or three days after the snow begins. One of the only ways of ensuring the survival of a herd when movement becomes impossible is to maintain a stock of fodder and hay in sufficient quantity to feed the entire herd. But to guard against losses in a bad *dzud,* in which up to eight weeks may pass before smallstock are able to reach pasture, a

herder will require sufficient supplementary feed every day for, say, up to 200 sheep. It quickly becomes apparent that it is well beyond the means of most individuals, or even communities, to maintain sufficient contingency stocks for such an event.

Impact of risk

As a climatic shock, *dzud* almost invariably fits into the category of covariate shocks which affect entire communities, and different sources of income (if herding different species is the main form of diversification of income). Until economic and political liberalisation, in fitting with Dasgupta's analysis, the state was the main actor in the management of environmental risks such as *dzud*. Two elements can be identified which perhaps have played the most important role in minimising the impact of natural calamities; the guarantee to supply suplementary fodder, where and when required, to all collective animals and insurance against the loss of collective animals. The small proportion of privately owned animals also benefitted from these arrangements, although somewhat more indirectly. In theory, herders were charged by the *negdel* administration for fodder supplied for private animals; however in practice, supplementary feed quotas for collective animals were often overestimated or fodder for private animals under-charged to ensure that herders were not giving priority to their own animals at the expense of the *negdel*. Similarly, it has been reported that *negdels* compensated for large-scale losses of privately owned animals by re-allocating some collective animals to the household (Potkanski and Szynkiewicz 1993).

State Emergency Fodder Fund

Negdels provided feed supplements free to their members, supplied from their own production (often herding households were required to supply a quota of cut hay to the *negdel* which would be redistributed to its members) or production purchased from the country's fodder farms and feed mills. The State Emergency Fodder Fund (SEFF) comprised perhaps the most important part of this system, as it acted as the main and in many cases only channel between fodder farm and *negdel*. The State Emergency Fodder Fund was formally established in 1971, largely as a response to the consistently bad winters of the sixties, and was originally intended, as its name suggests, to act as a supplier of last resort, moving feed supplements from areas of surplus production in the central, northern and eastern *aimags*, to deficit areas in

Table 2. *Different levels of risk of freezing snow (dzud)*

1. High risk provinces (major *dzud* at least once in 7 years):	
Dornogov'	Dundgov'
Khövsgöl	Zavkhan
Bayan-Ölgii	Ömnögov'
Övörkhangai	Gov-Altai
2. Medium risk provinces (major *dzud* once in 7-14 years):	
Arkhangai	Uvs
Bulgan	Khovd
Bayankhongor	
3. Low risk provinces (major *dzud* no more than once in 14 years):	
Sukhbaatar	Selenge
Khentii	Dornod
Töv	

Source: Estimated from Table 1.

the western mountain *aimags* and the drier Gobi *aimags* in the south. In its heyday it played a key role in mitigating potentially disastrous situations by maintaining substantial supplementary feed stocks at over 90 centres nationwide which could be called upon as the need arose. SEFF supplied fodder and hay to *negdels* at cost price, while central government paid transport costs to distribution points. As a result, SEFF was a cheap source of fodder for the *negdels* and its original emergency purpose became diffused; it quickly became a regular feed supplement supplier to deficit regions.

With the liberalisation of feed supplement prices and a 500 percent increase in the costs charged for transport between 1990 and 1992, the burden of SEFF on the state's increasingly scarce resources began to be felt. Since 1990, the scope of SEFF's operations has been greatly reduced. In May 1991, 41 distribution points were handed over to provincial governments to administer and finance, but almost none stocked hay and concentrates as was planned, and many have fallen into disuse (Coffey MPW 1992). A second 'rationalisation' took place in June 1993, and now only eight SEFF points remain. It is likely these will simply be stop-gap measures, channels to maintain the regular supply of supplements, until efficient commercial markets have been established; their ability to provide emergency supplies will be extremely limited. For example, the Gov-Altai provincial distribution point is now also responsible for supplying the three westernmost provinces, Khovd, Bayan-Ulgii and Zavkhan, yet its budget for the 1993 financial year (approx. 10,000 Mt hay and 5000 Mt fodder concentrates) is less than it used to supply the province of Gov-Altai alone in 1992.

The SEFF has had many problems in its history, including its cost, the poor quality of the supplements it provided, high levels of wastage, disincentive effects to local feed supplement production, and the market distortions it introduced. Nonetheless from the point of view of the herder, it has played an important role as a provider of contingency goods, in that it has provided a channel (via the *negdel*) through which fodder could be obtained at relatively low cost in the event of a severe winter. Currently, for herders in fodder deficit regions, obtaining feed supplements is becoming increasingly expensive, and in many cases increasingly difficult. This is likely to be a short term situation as a good deal of investment may be made in developing a competitive feed industry (Coffey MPW 1992). However the question of whether herders will individually be willing or financially able to take on the responsibility of maintaining contingency stocks remains open. Batbuyan *et al.*'s (1993) findings that expenditure on fodder is at the bottom of the household's priorities and constitutes only 3 percent of average total expenditure, suggests that in the immediate future herders will be neither willing nor able.

Livestock insurance

Livestock insurance was an original feature of the Mongolian socialist system, and was one of the few, possibly the only, example of apparently successful insurance of livestock herds under extensive traditional pastoral management. It was successful on two counts: it provided *negdel* members with effective protection against loss of animals from particular types of covariate risk, and it was also successful in financial terms, in that accrued premiums exceeded claims settled.

Until 1990, the only available livestock insurance was through the State Insurance Service (*Ulsin Daatgalin Gazar*) located in the Ministry of Finance; in 1991 this was transformed into the Mongol Insurance Bank, and the Supreme Council of Agricultural Cooperatives, the governing body of the *negdels*, established its own Agricultural Cooperative Insurance Company. Insurance of *negdel* animals through the State Insurance Service was compulsory until 1990, when it became voluntary.

Losses of animals from different causes were met in different ways. Epizootic disease prevention was a state responsibility, and losses from such diseases were met by the *negdel*, either by replacing the animals or by reducing obligatory deliveries of animal products under the annual plan. Losses from predation (especially wolves, also birds of prey and snow leopards), and accidents such as falling over cliffs or into rivers, were generally considered to result from the negligence of the herder, and were not insurable; however from 1991, losses to wolves were accepted for the first time, with the proviso that only half the loss could be claimed for.

The main category of animal loss covered by insurance was natural calamities, especially *dzud* and hail storms. These were considered to be beyond the responsibility of the herder, and were fully covered by the insurance. Claims were subject to investigation by a permanent 'loss certification commission' in each *negdel*.

Crop insurance was more problematic. In the agriculturally marginal Mongolian environment, crops are more vulnerable than animals to adverse weather; some Mongolians also think that Mongolian farmers may sometimes be irresponsible about crops in a way they would not be about animals. In general, state farms, the main crop producers, were not financially viable, and could not afford realistic premiums for crop insurance. Crops were in fact insured (against climatic disaster, flood and fire), but the premiums often amounted to less than half the claims in any one year. In these circumstances, livestock insurance, which was profitable, was used to subsidise crop insurance, which was not. At the start of economic liberalisation, there was a reluctance by the insurance companies to insure crops, although livestock was seen as a potentially profitable market.

During the 1990–91 transition period, when *negdels* leased animals to herders on contract to produce specified amounts of product, levels of permissible loss were specified in the lease. In general, the *negdel* insured the animals and in the event of a natural calamity reimbursed the herder and covered any shortfall in his product deliveries under the contract.

During the *negdel* period, few privately-owned animals were insured; it is thought that private animal losses were often attributed by their owners to *negdel* animals in order to claim for the loss. As a result, as most animals were turned over to private ownership in 1992, levels of animal insurance dropped sharply, with herders apparently unwilling to pay the premiums and unsure of the benefits. At present, it is thought that few private animals are insured, adding to the risk of climatic and other shocks.

Changes in risk during economic liberalisation

With the retreat by the state in economic management, and the removal of insurance and other safety nets operated by the state, environmental disasters are likely to have much more severe impacts on herder livelihoods in the future. Without the risk-reducing institutions of the collective, future disasters are likely to cause large inter-temporal fluctuations in total herd sizes, for all herders in the afflicted area. There is however, a further, perhaps more important aspect; the differential impact of environmental shocks on households within the affected community. There is sometimes a tendency to assume that natural calamities are 'great equalisers' in pastoral communities as they can cause massive fluctuations in the livestock holdings of individual households, not discriminating between rich and poor. However, evidence from pastoral societies in Africa suggests that climatic shocks have a larger impact on the livelihoods of poorer herders (Fratkin and Roth 1992). The limited evidence that is available from the winter of 1993 in Mongolia suggests a similar outcome. In the following section we provide a brief description of the *dzud* of 1993 and demon-

strate that although richer herders lost more livestock in absolute terms, poorer herders may have lost a greater proportion of their herd and therefore may have seen their ability to obtain a livelihood significantly more eroded than their wealthier counterparts.

Differential impact of *dzud* on a herding community

The *dzud* of March/April 1993 affected 24 *sum* (districts) in three provinces, Bayankhongor, Zavkhan and Gov-Altai. The early winter months had more snow and slightly lower temperatures than in previous years, and was considered to be a fairly mild *dzud*. Toward the end of February the snow began to melt, signalling the beginning of spring. Most herders began to move to their spring shelters, which in this part of the country are located on higher, more exposed ground than the winter shelters. However on 15 March, the temperature dropped again and it began snowing extremely heavily. In the worst affected areas, it snowed solidly until 20/21 March, by which time the snow was 60 to 80 cm deep in the steppe and between 90 and 150 cm in the mountains. Over the next two months, meteorological stations in the north-west of Bayanhongor province recorded a maximum temperature of -21°C and a minimum temperature of -48°C. Animal deaths began almost immediately as animals became trapped in snow, but the heaviest losses did not begin until 17/18 March when feed supplies had been exhausted. A national emergency was declared on the 20 March, allowing central government to mobilise the armed services and to finance the relief operations undertaken by provincial administrations. The provincial administrations used all available forms of transport to shift fodder and hay from SEFF storage points to individual households. The weather made transport nearly impossible for the first two weeks, although in the following six weeks contact was made with an estimated 75 percent of households and fodder delivered to at least a quarter of affected housholds (Tsedvesuren, director of SEFF, Bayanhongor, pers. comm.) Between 15 March and 15 May, three-quarter of a million head of livestock died, over 10,000 per day. One hundred and ten households, comprising about 600 people, lost every animal they herded, and 2,090 households (approx. 10,000 people) lost over 70 percent of their herds. The worst affected *sum*, Bayanbulag in Bayankhongor, lost 51,000 head of livestock, over 50 percent of the total.

Methods and sources

The question for analysis here is 'whose livelihood is most likely to be damaged by such a severe *dzud*?'. Several methods of quantifying the differential impact of climatic shocks and the level of economic differentiation within herding communities exist (see Fratkin and Roth 1992, Starr 1992 and Roth 1990) and the following analysis draws from these. These studies use household level data on livestock holdings pre- and post- shock to examine changes in the ability of individual households to remain as independent sustainable units. However, household data on livestock holdings and losses in the central area of the *dzud* are not available. Rather the following exercise uses data on livestock holdings and losses during March/April 1993 in Tsogt *sum*, Gov-Altai, an area on the South Western edge of the *'dzud* zone', to generate a counterfactual situation in which aggregate losses approach those of the most badly affected regions.

Tsogt *sum* lies in the mountain-desert steppe ecological zone, although the majority of herders restrict their movements to the Altai mountain range. During the worst months of the 1992/93 *dzud*, herders were in their winter or spring shelters, located at between 2,400 and 2,750 metres above sea level. From 15 March it snowed for two days, although not as heavily as

the rest of the affected area, leaving a snow cover of 30 to 90 cm on the winter and spring pastures. In the following two months, the bitter weather and the inadequate supplementary feed stocks led to the loss of over 14,000 animals, about 10 percent of the livestock in the district. Data on livestock holdings just before 15 March and species specific livestock losses during March and April was collected for sixty households in Dalan *bag* (sub-district). The data was obtained from censuses carried out by local officials. As routinely collected census information is used as a basis for establishing the tax liabilities of households, there is the possibility that herders underestimate their livestock holdings, and correspondingly overestimate their livestock losses to reduce their liability. However, cross-checking the census information with informants from 25 of the 60 households showed the data to be accurate to within +/- five percent. Even if underestimation of livestock holdings did occur, the data would remain valid for this analysis, based as it is on relative holdings rather than absolute numbers of livestock (given the assumption that the bias would occur across the board). Livestock counts of the different species have been amalgamated using the traditional *bod* livestock equivalent index. One *bod* unit is equivalent to one cow, one horse, seven sheep, ten goats or 2/3 of a camel. It should be noted that this is not an ideal equivalent unit as the goat, in this particular area, is the most important animal in terms of income; it is estimated that cashmere and goat meat provided over 50 percent of the income in the area during the first half of 1993, even though goats only constitute 44 percent of the animals herded (Batbuyan *et al.* 1993). Thus the *bod* unit may understate the importance of goats in relation to cattle, camels and horses for the economic well-being of the household.

To analyse the impact of the *dzud* on the well-being of individual herding households, it is necessary to find an appropriate indicator of 'well being'. This is a far from easy task in the Mongolian context. In the African context, Fratkin and Roth (1990) use numbers of livestock owned (expressed in Tropical Livestock Units) per household member, establishing a cut-off point below which the household can no longer achieve adequate levels of nutrition and is deemed as 'poor'. This method cannot be directly transferred for a number of reasons.

It is not clear that an appropriate threshold for defining poverty (lack of well-being) should be based upon nutritional requirements. In purely economic terms, it would seem more appropriate to approximate it to the level of holdings at which a herding household is no longer an independent economic unit and would, if the opportunity exists, switch out of herding. This threshold will be higher than that required to obtain minimum nutritional requirements. It could also be argued that poverty thresholds are at least partly the result of local perceptions of well-being, and that the relatively high level of services available to Mongolian pastoralists in the last three decades means that the poverty line should be higher than that required to achieve adequate nutritional levels alone. This is, however, conjecture and it would be hard and ambiguous to quantify such a threshold. With no obvious threshold with which to compare the situation *ex post* and *ex ante*, the alternative is to look at changes in the relative livestock holdings of households by comparing the distribution of livestock between households *ex post* and *ex ante*.

Another problem arises in using the number of livestock herded by a household as an indicator of well-being. Like many parts of Mongolia, there are different forms of livestock 'ownership' in Tsogt. About 66 percent of livestock are privately owned by the household herding them. The remainder belong to the local livestock company—the agricultural co-operative set-up as a half-way house between collectivisation and full privatisation—and are leased to herders. All households in the

sample owned at least some private animals and 33 also herded company animals. The question is whether or not livestock held under different ownership arrangements can simply be aggregated to give an indicator of well being; given the leasing arrangements, it is not apparent that one company animal adds to the economic sustainability of a household as much as one private animal. An alternative way of identifying an appropriate livestock based indicator is to examine herders' own perceptions about poverty. Grandin's (1988) card-sorting method was used to rank the relative 'well-being' of individual households in the local community. Relationships between this subjective measure (the well-being rank) and the more objective measures (like livestock counts), could then be established. Spearman's rank correlation coefficient was used to measure the degree of correlation between a household's perceived well-being rank and its rank according to the number of privately owned livestock, leased animals, total number of animals, and the number of animals per capita in the household. Table 3 presents the results.

The rank according to the number of privately owned livestock is the most strongly related index to herders' own perceptions of well-being (it should be noted that a high correlation between two variables does not imply causality in either direction; all that can be implied is that households with a high well-being rank have more private livestock than poorer households). Total livestock herded does not have such a strong relationship with perceived well-being since it incorporates leased animals. The latter shows a negative, although statistically insignificant, relationship with perceived well-being. In other words, poorer herders are likely to be herding more company animals than their richer neighbours. This is in accordance with the observation that, in most cases, herders themselves would prefer to have enough private livestock to avoid having to herd company animals at all. The inverse relationship lends evidence to the argument that total (private and company) livestock holdings may not be truly representative of a household's well-being.

Given these qualifications, livestock numbers per household are used in the following analysis on the basis that they provide the most suitable indicator of well-being for this particular sample. Since there is no obvious way of aggregating company and private animals to produce an appropriate index, the changes in the number of privately owned animals is focussed upon, although an equivalent analysis for total livestock herded is included. Using these data, the impact of the *dzud* on the distribution of livestock holdings is examined, followed by an extrapolation of actual events to investigate what could occur following a more severe climatic shock.

Results

Table 4 shows total livestock holdings (company and private) prior to the *dzud* and the mean losses suffered by the sixty households during March and April. Losses averaged around 6 percent, with 70 percent of all households losing at least one animal. Camels and horses were least affected as they were left to graze on their own in the desert steppe, some 20 kilome-

Table 3. *Correlation between perceived herder well-being and numbers of livestock*

Correlation Coefficients (N=60)	Privately owned livestock	Leased livestock	Total livestock herded	Livestock herded per capita
Well-being rank	0.69*	-0.22	0.52*	0.51*

*statistically significant at the 1% level ($p<0.01$)

Table 4. *Holdings and losses during Spring 1993, Dalan bag, Tsogt sum*

60 Households	Holdings (March 1993)				Losses (March–May 1993)			
	Mean	Min	Max	Total in area	Total lost	% lost	Min lost	Max lost
sheep	57.6	0	178	3458	250	7.2	0	28
goats	92.6	0	188	5558	322	5.8	0	48
cattle	7.2	0	26	430	45	10.5	0	7
horses	3.8	0	12	229	8	3.5	0	4
camels	2.9	0	15	174	2	1.2	0	1
Total head of livestock	164.2	27	381	9849	627	6.4	0	85
Total (in bod units)	32.7	6.6	87.6	1959.9	123.2	6.3	0	11.42

tres to the south of the winter and spring camps and as much as 1,000 metres lower, where there was relatively little snow. Cattle suffered the worst relative losses; although figures are not available, herders maintain that the losses were restricted to cattle rather than the hardier yaks (which are grouped with cattle in the statistics). The inter-species differences in losses largely fit herders' views that cattle, followed by sheep and goats, are the most vulnerable during *dzud* as they are least mobile and least able to dig through the snow to find pasture.

It is often said that the collective period in Mongolia has left the pastoral economy with a relatively equitable income and asset distribution. However, for a variety of reasons, including the ways in which animal allocation decisions were made during privatisation, this is changing rapidly. One result of the inequitable distribution of productive assets is, as Fratkin and Roth (1992) found in Kenya, that although an environmental shock affects all households equally, it will necessarily have a greater impact on the well-being of resource poor households.

In the sixty sample households there is indeed an inequitable distribution of livestock; the poorest 20 percent herd only about 6 percent of total livestock, while the richest 20 percent herd about 38 percent of livestock. A useful way of measuring changes in the equality of distribution of a variable is to look at the gini coefficient which gives a number between 0 and 1, where 0 means an exactly equitable distribution and 1, an exactly inequitable distribution. For the sample households the gini coefficient for the distribution of total (private and company) livestock prior to March 1993 was 0.31. Six percent average loss is relatively small and unlikely to have a significant impact on livelihoods in the area. However with the poor distribution of livestock, these losses were not spread evenly across the sample; richer herders suffered from higher absolute losses, but poorer herders tended to have higher relative losses. Tables 5 and 6 show the average losses (of total and private animals respectively) suffered by each quartile of households (i.e. each fifteen households) divided up by livestock wealth.

Although the richest households lost more livestock in absolute terms than the poorest two quartiles, poorer households lost more of their herds. This picture is even starker when one considers private livestock holdings alone, as the distribution of private livestock is far more inequitable. It has a gini coefficient of 0.368, with the poorest 20 percent owning only about 4 percent of the total and the richest 20 percent, about 45 percent of the total. Table 6 shows aver-

Table 5. *Total livestock losses by quartile*

N=60		Losses (Mar-May 93) HH average (in bod units)	As a % of HH herdsize
Poorest quartile	1	0.7	6.1%
	2	2	8.2%
	3	2	5.8%
Wealthiest quartile	4	3.6	5.9%

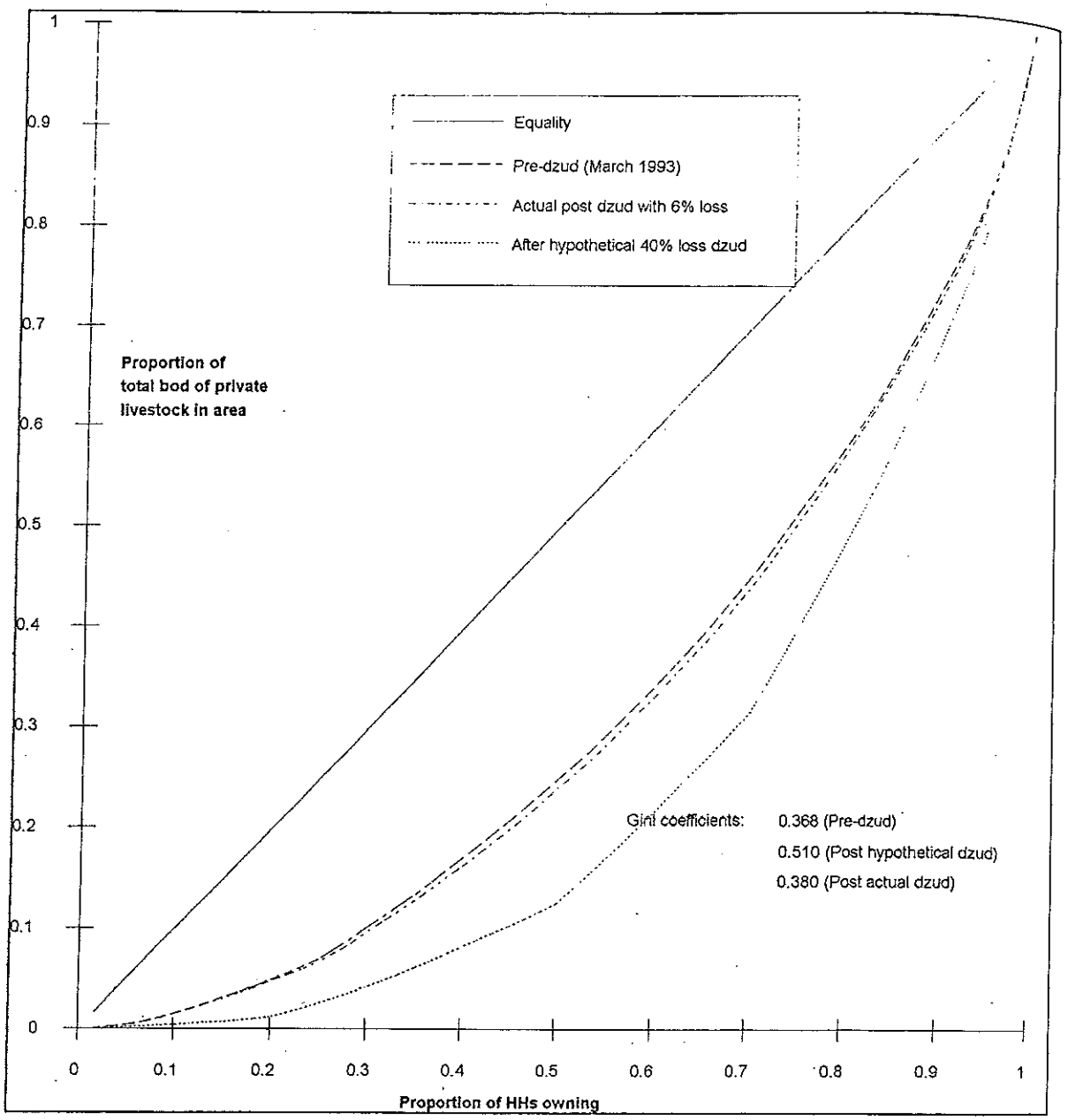
Table 6. *Losses of privately owned livestock by quartile*

N=60		Losses (March to May 1993) HH average (in bod units)	As a % of HH's private herd
Poorest quartile	1	0.5	8.0%
	2	1.3	8.0%
	3	1.2	4.7%
Wealthiest quartile	4	1.3	2.8%

age absolute and percentage losses of private animals for each quartile. In this instance, the richest 25 percent of households lost only 2.8 percent of their herds, whilst the poorest lost 8 percent.

The losses suffered in the Tsogt sample area by even the poorest households was small and cannot be regarded as disastrous. However, poorer households suffered significantly more than richer households from a shock which affected the entire area. This suggests that environmental shocks are not 'great equalisers', but tend to affect poorer sections of a community more. The importance of this can be illustrated if we use the Tsogt data to simulate the impact of the 1993 *dzud* in the areas most directly affected. There, aggregate losses as high as 40–50 percent were reported for individual *bags*. If the distribution of losses was similar to that found in Tsogt, as we suspect it may have been, and if, as expected, the great majority of these animals were not insured, the impact upon poorer households would have been disastrous. To demonstrate this, a 40 percent aggregate loss figure is applied to the data for Tsogt, using the distribution of relative losses empirically observed. The sample households are divided into deciles[3], according to livestock wealth, and new average losses for each decile are calculated by adjusting the observed percentage loss for each decile by the ratio of the hypothetical aggregate loss (40%) to observed aggregate loss[4]. This method of calculation maintains the empirically observed inter-decile distribution of losses, whilst producing an aggregate loss figure of 40 percent. The method is not ideal as it assumes that for an individual household, the likelihood of losing an animal at the margin remains constant; in other words, a household is equally unable to avoid the loss of the first animal as it is to avoid the loss of the last animal of the household herd. In reality, one would expect that a household is more able to avoid losing the last few remaining animals of its herd than it is for the first few animals that die during a crisis. Thus this exercise should not be interpreted as anything more than illustrative of the trend in the distribution of relative losses that might be expected following severe climatic shocks.

Figure 2. *Lorenz curves for a hypothetical dzud in which 40 % of all private livestock are lost*



The results are clear; in absolute terms, richer herders will of course still lose more livestock, but the disparity in percentage losses between rich and poor is now much greater. The poorest quarter of herding households would expect to lose 70 percent of their privately owned animals whilst the richest quarter would only expect to lose only 24 percent. Indeed the poorest six households would expect to lose nearly all their privately-owned animals. The resulting change in the distribution of livestock is severe, with the gini coefficient becoming as high as 0.510. Figure 2 illustrates this by plotting the Lorenz curves of the distribution of private livestock within the sample in March 1993, and the distribution within the sample after a hypothetical *dzud* resulting in 40 percent aggregate losses. As the figure shows, in these circumstances it would be expected that the poorest 20 percent would end up owning less than 1 percent of the total private livestock, whilst the richest 20 percent would own over 50 percent.

This marked disparity between rich and poor following a natural calamity also occurs when the same exercise is carried out for total (private and company) livestock holdings, although not to such a large extent. The direction of change in the distribution of total livestock herded is the same, but to a smaller degree, with the gini coefficient increasing from 0.314 prior to the hypothetical *dzud*, to 0.372 afterwards.

Two seperate conclusions emerge out of this case study. The first is that, based on the evidence from Tsogt, it seems that poorer herders are likely to lose a higher percentage of their herds than richer herders, increasing the inequality of distribution of livestock. If the environmental shock is severe, then the impact on the holdings of poorer households is likely to be disastrous. If we take private livestock holdings, or even total livestock holdings, as an indicator of the well-being of the household, then the well-being of poorer households is reduced by a significantly larger amount. The reasons why poorer herders lose a larger percentage of their herds, when it would be expected that the spread of relative losses would be equal for all levels of wealth, are not clear; it might be hypothesised that wealthier herders are able to hold larger stocks of supplementary feed per unit of livestock, or possibly that wealthier herders are located closer to district centres, and therefore better able to obtain foodstuffs in emergencies. However a discussion of these issues would merit a paper in its own right, and is not tackled here.

Even if relative losses were distributed evenly across rich and poor households, the second, and perhaps more important conclusion would still hold. There is likely to be some threshold at which the herding household is no longer an economically viable entity, and would be considered chronically poor. The outcome of an environmental shock to a community with an unequal distribution of wealth, even if all households suffered from equivalent relative losses, would be to push averagely well-off households below this 'poverty line', and poor households even further below it; an increased number of households would face impoverishment, with insufficient core herds to be able to build or re-build their wealth, whilst wealthier households would not suffer such obstacles, ultimately leading to increased levels of inequality. A precise figure for this cut-off point, in terms of herd size and composition, is far from clear and is likely to continually change during the period of transition as the terms of trade facing herders change. Potkanski and Szynkiewicz (1993:70) in reviewing Mongolian herders' concepts of poverty, similarly conclude that "some years of living in the conditions of the market economy are necessary for a more precise concept of a viable herd to appear".

The implications of the marginalisation of poorer households are many. In the short term, it is likely to have productivity effects as middle-income and poorer herders adopt risk minimising strategies. Ultimately it may lead to households being driven out of the pastoral economy altogether, a phenomenon common in Africa. Whilst some might argue that this is a 'rationalisation' of an economic sector suffering from the distortions of the centrally planned system, there are currently few alternative sources of livelihood available in rural areas. One scenario envisages a return to the 'bad old days' of the pre-collective period, with the rural poor becoming the hired workers of livestock rich households (PALD 1991).

Conclusion

The household level effects of the 1993 *dzud* remain to be seen. A number of rehabilitation plans have been drawn up by the provincial administrations, central government and the remaining livestock co-operatives, of which most important to individual households will be the attempt to provide animals, brought in from outside

the area, to households that suffered more than 50 percent losses. At the time of writing, however, funds had not been made available to do this on any large scale. The estimated time for rehabilitation is put at between 4–5 years, if sufficient financial help is made available, or 8–10 years without external intervention (livestock specialist, Bayanhongor Provincial Administration, pers. comm.).

The experience of herders in the *dzud* of 1993 is, in many ways, a new one, as it is the first in most people's lifetime in which the *negdel* has not provided substantial support. The virtually guaranteed supply of fodder through SEFF, the maintenance of contingency stocks and the indemnity (through insurance) against losses during the collective period meant that many of the key risks associated with animal production were carried by the state. This has changed with privatisation and risk is now largely carried by individual households, the exact consequences of which will unfold in the near future. The *dzud* of 1993 was particularly severe. However without the safety nets of the past, smaller scale, more frequent localised environmental shocks may now represent a real danger for households on the brink of impoverishment.

For shocks which are household specific (e.g. illness), risk pooling and risk spreading by households themselves are likely to become increasingly important forms of risk management and changes in the production system will reflect this. The re-emergence of traditional pastoral institutions through which risk pooling can be achieved, such as the *khot ail* system, is already beginning to occur (Cooper and Narangerel 1993). However their effectiveness may be limited to begin with; as Potkanski and Szynkiewicz (1993:67) note, "channels of assistance through...the *negdel* administration has resulted in a lack of clear, specialised redistribution, or mutual assistance, mechanisms within the social system". Similarly, the spreading of risks through the increased diversification of herd composition (more species, with a more stable age and sex structure) has been observed (PALD 1991).

For shocks which affect whole communities, such as those described in this paper, we have argued that to avoid increasing levels of economic differentiation, the only forms of risk management which can be effective, are ones external to the affected group. It is unlikely that the government will revert to a highly interventionist system of state support, both due to the changed ideology and the present severe financial constraints. However, until formal insurance markets have developed there is a place for the Government to intervene to facilitate provision of insurance and emergency assistance. The SEFF, for example, in its present form, is clearly unsuited to the resource-poor free-market economy; nonetheless its original goals should not be abandoned, because they are more important than ever in the new risk conditions of the market economy.

The danger, if adequate state-supported safety nets are not developed, is threefold:

–first, in the event of a major crisis such as the 1993 *dzud*, animal losses overall will be unecessarily high across the board, and the overall productivity of the livestock sector and its contribution to the national economy will be set back;

–second, as suggested in this paper, this impact will not be evenly spread through the community; poor households will suffer disproportionately, and this could lead rapidly to unacceptable levels of rural economic differentiation and poverty, with high social costs and government welfare expenditures;

–third, livestock productivity in general, outside crisis periods, will also decline as all herders rationally adopt safety-first, risk-avoiding economic strategies, at some cost to productivity.

The policy implications of this are clear. There is above all an urgent need for an effective emergency and safety net policy, setting out the government's approach to future emergencies. As part of such a policy,

the SEFF should be reformed and revitalised, with adequate resources, to play its original role as a fodder supplier of last resort in emergencies. In the meantime, until this reform is effective, it is important for SEFF to maintain a capability in case of emergencies during the transition. This might be a suitable role for donor support.

There is an urgent need to revitalise the livestock insurance system, and adapt it to the changed circumstances of the market economy and predominantly private animal ownership. There may also be a case for an emergency fund in the most vulnerable provinces, financed from a levy on livestock marketing, to provide rapid assistance in emergencies, for example in paying transport costs for emergency fodder or moving animals away from the centre of the affected area.

Notes

[1] A third component—perception of risk—is essential to risk analysis more generally, but is not considered in detail here.

[2] A 5 percent average loss for a province can be the result of 10 percent of herders losing half their animals, with the rest suffering no unusual losses.

[3] Deciles, rather than quartiles are used to avoid creating 'lumpiness' in the resulting data.

[4] To give an example, two households, A and B, one with a herd of 50 and the other with a herd of 150 are observed to lose five animals and ten animals respectively. This equates to a relative loss of 10% for household A and 6.7% for B and an aggregate loss of 7.5% for both households combined. If the distribution of loss is representative of all levels of aggregate losses, we would expect that for an aggregate loss of 40%, household A would lose 27 animals ((0.4/0.075)*5) or 53% of its herd, and household B, 53 animals ((0.4/0.075)*10) or 35% of its herd. Thus the distribution of losses is maintained, but with an aggregate percentage loss of 40%.

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