

LIVELIHOOD STRATEGIES IMPROVING THE ENVIRONMENT? HERETICAL VIEWS¹

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During six years of research in Tarija, southern Bolivia, we have accumulated evidence of a number of positive changes in the physical environment. Areas of acacia scrub appear more widespread, and cattle have become more common and sheep less common than a generation or two ago. Soil erosion is not as widespread as has been reported. Some of these changes contradict the beliefs of townsfolk and national and international development technicians. They stress the importance of extreme soil erosion; comment on the widespread overgrazing as contributory factors in continued erosion and imply that livestock numbers should be reduced.

This suggests that, in order to understand such widespread beliefs, one should question the basis of the technical knowledge of consultants who support such views. However, it is also necessary to recognise the pressure under which politicians and other decision-makers are put to highlight apparent environmental threats. These pressures encourage the presentation of environmental phenomena as major factors holding back positive economic and social change in order to maximise the flow of much-needed income to development agencies at a regional level. It is plainly in the interest of Tarijeños to ensure that erosion in Tarija is a major item on regional agendas at national and international meetings. Even so, it should be recognised that political action needs to be supported by accurate information.

In the Global North other pressures encourage the minimisation of the credibility of evidence that links environmental deterioration to human agency. In the USA particularly oil companies, automobile manufacturers and environmental ostriches combine to encourage continued unchecked use of global resources with scant regard to the consequences for the wellbeing of future generations of people. Europe's role is little worthier of respect but it does contribute less to global resource consumption and makes positive contributions to debates on controlling resource use.

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Issues relating to long-term environmental changes were debated by geographers and other environmentally aware people in the 1970s and 1980s. The debate was then around such issues as the alleged recent expansion of the Sahara and the problems apparently associated with the deforestation and erosion of the Himalayas (Ives & Messerli 1989, Thompson and Warburton 1985, Guthman 1997 and recently in various chapters in Leach and Mearns 1996). The evidence for the expansion of the Sahara was shown to be distorted - aerial photos taken in dry years apparently showed desert advance but later wet years revealed a commensurate retreat. The perception of deforestation and erosion rates in the Himalayas was shown to be highly variable and very varied patterns of change existed.

In the 1990s, evidence has accumulated to show that some long-term changes are taking place. The rapid expansion of the hole in the global ozone layer is continually monitored and commented upon. Evidence of gradual global warming increases although myriads of regular extreme weather phenomena are popularly but erroneously associated with such change. The debate has been further advanced with the publication of the influential collection of essays in **The lie of the land** (Leach and Mearns 1996). These refer to a range of research in Africa that further questions widespread views of environmental deterioration. None of this debate seeks to minimise the importance of environmental deterioration in many areas where its progress has been carefully documented but it exposes many myths long constructed around inappropriate or misleading evidence.

The Universal Soil Loss Equation [USLE], beloved of generations of soil scientists, has been used to estimate soil loss over large catchments. The data from such plots can be grossly misleading. Soil erosion plots, in which soil loss is carefully measured following well-tried methods, provide data that do nothing more than measure soil loss on such plots. They offer little indication of actual soil loss in cultivated fields, or vegetated hillsides (Stocking 1996). Extrapolation from such data to quantify soil loss over large areas such as river basins is unreliable and can be grossly misleading.

This debate has been little developed in relation to Latin American environments. The social context of soil erosion was discussed by Ashby (1985) but even Mexican environmentalists, sensitive to so many issues, have shown limited interest in such matters even though Collier examined environmental changes in Chiapas some decades ago (Collier 1975). The recent debate on the history of environmental deterioration in Central Mexico has largely been focused on changes 500-700 years ago rather than on present changes (Melville 1990, O'Hara et al. 1993, Enfield 1997). Extensive studies of erosion in Ecuador by French soil scientists generated maps of erosion and data from Wischmieier plots but show little awareness of the limitations of their methods (De Noni 1990, CEDIG 1986). These studies have not been extended to identify those areas where erosion is recent but they have helped the adoption of common anti-erosion practices. Zimmerer studied soil erosion perceptions and remedial action in a part of Cochabamba, Bolivia in 1991. He ascribed terrace deterioration to labour shortage and implied a lively

awareness of soil erosion as an issue at a community and household level (Zimmerer, 1993). Critical assessment of supposed environmental deterioration is rare and there seems a widespread insensitivity of the need to identify the history of environmental changes. Many changes are believed to be recent and increasing in importance despite lack of evidence.

In an earlier paper the contradicting perceptions of a Bolivian environment were identified and discussed (Preston 1996, 1997). The perception of urban people in Tarija is strongly influenced by the badlands that surround the city, even though they represent only a small part of the Tarija valleys. Tree planting has long been an important part of supposed remedial rural extension work although earlier activity centred on the planting of eucalyptus and pines that are not now thought appropriate. Rural people do not necessarily share these urban perceptions of either their problems or desirable solutions. In a questionnaire administered in sample households in the Camacho valley in 1992, few people mentioned erosion as a major problem. More important were matters like communications, access to medical care, advice on plant and animal disease and quality of schools (Preston 1993). These contrasted perceptions are but two of a spectrum of ways of regarding the Tarija environment. Any search for truth needs to recognise that the nature of the people expressing the views is reflected in the views themselves.

Whatever the range of views of the Tarija environment, it is necessary to identify those changes that are modifications of the environment. In particular it is necessary to establish the evidence for change and whether the rate of change is increasing, as well as the probable direction and speed of future change.

In this paper I shall demonstrate some of the sorts of evidence to which one must have access to describe such historical scenarios and outline some apparent positive changes in a southern Bolivian landscape. I shall show how local, regional and transnational migration of people and livestock has enabled households to make a living for some decades now. I shall also suggest why this diversification in use of ecological zones and in livelihood strategies has logically led to environmental changes. In conclusion, it will be suggested that these sorts of changes can be found in other world areas.

Ancient and recent history of Tarija

It is first necessary to review the likely historical context of erosion in this part of the Central Andes in order to present a revisionist view of the state of erosion in the valleys of Tarija based, in part, on recent research. The environmental impact of the large properties of the pre-land reform period has never been assessed but such properties developed slowly during the colonial period because of dangers from Indian attacks. The city of Tarija was founded by Luis de Fuentes in 1574. At the time of his death 24 years later, he already had 2000 cattle and 4000 sheep on his land both in the valleys and at Izcayachi on the adjacent Altiplano (Bass Werner de Ruiz 1992). This gives some indication of the speed with which flocks of newly introduced grazing animals grew in the immediate post-Conquest period. Whatever the

environmental changes wrought by the arrival of Old World grazing livestock in Tarija, they were possibly less than in areas not subject to Indian attack but we should assume that widespread grazing did cause vegetation change. No historical sources have yet been found which provide firm evidence for change in specific areas.

Environmental pressures also developed during periods of economic prosperity. The apogee of Tarija economic and social development in the 1880s may have placed more pressure on the regional environment as farms expanded to increase production for a growing urban market and as profits were invested in more intensive farming.

Many commentators on the history of Tarija in the latter half of the 20th century imply that the sub-division of the great estates following the revolution of 1952 led to the creation of micro-holdings. On these holdings it is alleged that over-grazing became more widespread and as a result of cultivating easily eroded slopes, soil degradation was accelerated (CEDLA 19xx). Farming certainly changed following the land reform of the 1950s and few large estates survive in highland or valley Bolivia but there is no firm evidence of accelerated environmental change during that period. The biggest changes that followed the land reform in Tarija may have been in the highlands. Here, large sheep ranches have now disappeared and new management systems were introduced by the peasant unions that restricted access to livestock from other areas (Preston 1998a).

Soil erosion in the valleys of Tarija

Our recent research, mainly in the Camacho valley in Tarija, has led us to conclude that the extent of soil erosion is greatly exaggerated. The remarkable badlands that fringe the city of Tarija have been formed over centuries and probably millennia. They are not recent. They occur in easily eroded lacustrine sediments that outcrop, to a limited extent, around the margins of the central valleys of Tarija.

Observation throughout the Tarija valleys and geomorphological mapping in the Camacho valley leads us to suggest that, although erosion is widespread, it was most active many centuries ago. Although most hillsides have only sparse vegetation, soil loss is limited and most slopes are stable, losing no more soil now than a century ago. Although a major report by GTZ in the 1980s publicised that 75 per cent of the central valleys are eroded, in another part of the same report a figure of 35 per cent is quoted (GTZ 1988). These data derive from an unreferenced report by Beattie whose criteria for arriving at the figures are not outlined or discussed. Our own estimate, as yet unsubstantiated by detailed air photo analysis (currently underway), is that about 10 per cent of the area under 3000m is being actively eroded. By active erosion, we mean active gully enlargement and accelerating soil loss. Soil loss measurement by Tarija soil scientists and our own research suggest that soil loss on typical valley slopes is moderate (220t/km²/yr).

Further firm evidence of the trend in erosion comes from recent studies by geomorphologists in one sub-catchment of the Camacho using lichenometric dating techniques. They concluded that floods since the 1840s had gradually diminished in frequency and magnitude (Warburton, Macklin and Preston 1998, Meldrum 1998).

We conclude, therefore, that the environment of the Tarija valleys has changed. Evidence of soil erosion is widespread and vegetation has certainly been changed by humans and domesticated livestock. However, many of the changes are old and there is no evidence to suggest widespread acceleration of erosion except in restricted locations.

Migration, livelihoods and livestock

A very different approach to developing understanding of Tarija environments is to consider how changes in household livelihood strategies may have led to different resource uses. Migration has grown in importance since the earlier part of the century. Migration has been an important part of domestic livelihood strategies for at least two generations. Therefore, farming is responsible for only a part of the sustenance of many households. Migration is towards the areas of intensive commercial farming particularly in Santa Cruz and Bermejo in Bolivia and NW Argentina. Migration affects the part that livestock play in rural Tarija livelihoods in at least two ways. The frequent absence of some members of rural households leads to a shortage of labour. Some of the migration savings are likely to be invested on the farm. Investing in cattle is secure; they can be sold relatively easily at any time, and the animals tend to increase in size and thus value. Customary livestock management is not labour demanding and cattle, in particular, spend long periods unsupervised in distant pasture areas (Preston 1998a).

Seasonal livestock movements are important to those with more than just a few cattle. Transhumant cattle go to East-facing Mountain slopes several days walk towards the Chaco between Easter and All Saints Day. There are also movements to different microenvironments between contiguous communities. This reduces the dependency of households on strictly local resources and allows some people to keep increased numbers of livestock. The pattern of livestock movements seems to have changed since the 1950s. Seasonal movements to graze under-used pastures on the altiplano and slopes of the Río San Juan de Oro that existed prior to the Revolution and agrarian reform of 1952 stopped as newly-formed peasant unions restricted access to such areas.

Evidence from a range of sources suggests that both livestock numbers and herd composition has changed since the beginning of the century. Although there are no reliable data that show comparable livestock numbers, the importance of sheep has declined markedly. At the beginning of the century, they formed two-thirds of livestock in the upper Camacho valley; by the 1980s and 90s, they were only one third of livestock according to two separate surveys (Preston 1998a). Because of the very different

grazing habits of cattle and sheep, even despite a possible increase in the goat population, it is probable that vegetation in areas now grazed by fewer sheep will have become denser. This coincides with an extension of areas of churqui (*Acacia caven*).

In the communities in which we have worked during the 1990s there is ample evidence that areas that were cultivated are now left to revert to churqui-covered pastureland. This is because the number of mouths to be fed has decreased as a consequence of seasonal and permanent migration. Data from reliable local censuses for school attendance suggest that total population in the two communities studied intensively has declined by between 1 and 5 per cent per decade during the past 20 years (Preston, Macklin and Warburton 1997, Table 1). This too will probably lead to less land being cultivated and an increase in areas covered by churqui.

Although we lack a quantitative measure of the area colonised by churqui since the first aerial photographs of 1966, evidence from households in two communities indicates some cultivated land becoming churqui-covered pasture. There is also a denser churqui cover of hillsides that were relatively bare 30 years ago. Churqui is an aggressive coloniser of land and a most tenacious weed in cultivated fields. It has also the singular advantage of providing fuelwood and even timber for households, grazing for goats and provides shelter and shade for grazing livestock. Being leguminous, it also contributes to soil improvement and our soil studies showed convincingly that some of the better soils were in fields colonised by churqui (Salm 1996).

Conclusion

We have shown that the contrast between popular views about the state of the environment that are unsupported by evidence needs to be challenged. Such views may also be different from those of rural people. Active soil erosion is not as widespread as supposed and covers a much smaller area of the valleys of Tarija than has been believed. Changes in land use and in livestock suggest that the vegetation cover is improving.

The changes in both livelihood strategies and environment reflect changes that are widespread throughout the world. Increased population mobility has facilitated migration. The continued difference between earning potential in high and low income countries, between urban and rural areas and between isolated rural areas and those producing for national and world markets encourages people to combine life in more than one locality. Tarija household livelihood strategies have become modified to take account of the importance of migration to Argentina and, to a lesser degree, Bermejo and Santa Cruz. The absence of some household members and their continued financial contribution to rural Tarija households has led to the changes outlined above. These trends towards a greater diversification of household livelihoods have resulted in improved conservation of some resources. This tendency is not

peculiar to southern Bolivia. In earlier studies in northern Ecuador the less intensive use of hillsides was shown to have resulted in a better vegetation cover and reduced soil loss (Preston 1990). Some comparable situations in Java and Luzon justify the proposition that this is a contemporary worldwide trend in farming some areas that may lead to environmental improvement (Preston 1988b).

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