Deforestation in the Nepal Himalaya: Causes, Scope, Consequences*

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Since the end of the 1960s the public has been acutely sensitive to issues involving the degradation and protection of the environment. Forests and the threat posed to them by humans have from the beginning been a prime focus of attention. This may have to do with the fact that for many people, especially those in industrialized countries, forests represent the quintessence of the natural world, and the condition of forests is symbolic of the condition of nature as a whole. In Germany, for example, the indignation over the pollution of the atmosphere and soil reached a high point when the "death" of large tracts of forest was traced back to such influences. Similarly, the forests of the Nepal Himalaya have become a central topic of environment-related discussions, which began in the 1970s, and in the 1980s evolved into a controversy that is still going on to this day. An attempt will be made here to sketch the history of this controversy and its current status.

Two phases may be distinguished:
-- the phase of the 1970s, during which, particularly on the basis of reports by the FAO and the World Bank, a rapid and progressive destruction of forest land in the higher elevations of Nepal was asserted, coupled with the prediction that the consequences would be immediate and catastrophic - for example, in a 1978 report of the World Bank that anticipated the complete deforestation of the Nepal Himalaya within the coming 15 years, that is, by the year 1993;
-- the phase of the 1980s, during which years an opposing movement got under way, supported particularly by scientists associated with Jack Ives, whose position, summarized in the 1989 book *Himalayan Dilemma* (written by Jack Ives and Bruno Messerli) is directed against the representatives of the so-called "theory of Himalayan environmental degradation."

The line of argument followed by this theory may be summarized as follows:
The environmental catastrophe in the Nepal Himalaya is a phenomenon of the recent past, having its beginnings in the opening of the previously closed country in 1951. The major effect of subsequent modernization has been in the field of medicine, and the consequent sudden rise in population. This in turn has implied increased demand on the country's natural resources, particularly on its forest resources. There have basically been two reasons for the strain on the latter: the clearing of woodlands to expand field acreage for the increased population, and the increased demand for firewood, Nepal's most important source of energy. The ever more rapid destruction of forests that has resulted from these two main areas of exploitation has had consequences such as increased surface run-off, accelerated soil erosion and catastrophic flooding in the forelands of the Nepal Himalaya.

The doubts that were raised against this briefly sketched catastrophe theory were directed principally against the following links in the chain of argument:
-- the supposedly rapid tempo of the deforestation process, and in this connection the assertion that the destruction of forests has been a consequence of modernization, and thus a problem that arose only after the opening of Nepal;
-- the supposition that the clearing of land and use of firewood are the main causes of forest destruction;
-- the view that floods in the Himalayan forelands can be directly linked with deforestation in the mountains;
-- the assertion that mountain forests are the principal ones affected by the process of deforestation.

It may be added that, from the geographical perspective, "the forest" is treated in this explanatory model as an abstract entity, without the multiplicity of forest types in the Nepal Himalaya, or their spatial arrangement, being taken into account. Here the differences come out above all within a verticalization - that is, within a sequence of forest levels. The types of forest, which differ with regard to species composition and stand structure, serve a variety of functions for those who exploit them, and are influenced and transformed by such persons in a variety of ways.

In the following, the three subtopics mentioned in the title - the scope, causes and consequences of deforestation in the Nepal Himalaya - will be discussed in greater detail.

In order to determine the scope of deforestation, it must first be made clear what exactly is understood by the terms "forest," "forest destruction" and "deforestation." The use of imprecisely defined terms regularly leads to misunderstandings, such as when the term "forest" is used to denote, not a tract of land containing a growth of trees, but rather a tract of land in the possession of a forestry administrative unit.

The percentage of crown covering, that is, the portion of a tract of land covered by the crowns of trees, is the optimal method for narrowing down the definition of forest tracts. This figure can be determined both in the field and from aerial photographs, and is thus suitable for both small- and large-scale target areas. Moreover, it is possible to fix threshold values, below which it is no longer forest but open woodlands or brush that is the object of study.

An exact determination of the forested area of Nepal took place in the 1980s under the Land Resources Mapping Project (LRMP), with the use of aerial photos from the years 1978/79, which were supplemented by a series of aerial photos from the years 1964/65. Various categories of crown covering were excluded, and only those tracts with a covering of more than 40% were termed forests. The result was, at that time, a forest area amounting to 28.1% of the total area of Nepal.

As for the terms "forest destruction," "deforestation" and "forest degradation," one can perhaps settle on calling deforestation only that which involves the actual loss of forest tracts or the transformation of forest land into other forms of vegetation - for example, into tracts of brush or grass;

whereas the term "forest degradation" is used only for changes in the structure of forest - for example, a thinning of growth, a drop in growth heights, a decrease in the age of growth, and the like.

From a comparison of the series of aerial photographs from 1965 and 1979, the development of forested areas could be determined over a period of 14 years. The study led to the surprising result that during this period 1.5% of the forested area in the high-lying region, and by contrast 24% of the forested area of the Terai (the northern portion of the Ganges plain at the foot of the Himalaya), was lost. In the mountain chains bordering the Terai to the north, the Siwaliks, the loss of forested area, approximately 15%, was also quite considerable. Deforestation on a large scale thus took place in Nepal after 1950, but not, as generally assumed, in the Nepal Himalaya, but rather in the low-lying forelands and border mountain chains. The deforestation of the Terai is the consequence of a displacement of the local farming population from the hills to the fertile Terai, once the latter had lost its frightening reputation as "Nepal's hell of fevers" following the campaign to wipe out malaria in the 1950s. This migration has led to a shift in the population's centre of concentration from the Himalayan foothills, the kingdom's historical core region, to the plains at the foot of the mountains, and has increasingly assumed the proportions of a large-scale flight from the mountains.

Through a comparison of aerial photos, the extent of deforestation in the Terai became apparent for the first time. The result for the high-lying regions during the same period of 14 years was, along with a small loss of forested areas, a reduction in the crown covering by approximately 15%, that is, significantly more forest degradation than deforestation.

The clearly lower rate of deforestation in the high-lying regions in comparison with the Himalayan forelands also means that the clearing of land after 1950 to extend field surface areas in the mountains cannot have been as extensive as it once was thought. An analysis of historical documents - for example, land titles - suggests that the transformation of forest areas into farmland generally took place before 1950, and that this was carried out most intensively in the 19th century.

The underlying reason was the kingdom's finance policy, which generated government revenues principally from land taxes and thus actively promoted the expansion of the area of assessable agricultural land. This occurred through the use of incentives, such as the temporary exemption from taxes for newly won land, or through land grants rather than cash payments for members of the military. The clearing of land that was spurred on by this came to an end in the high-lying regions before 1950, and the influence of humans on the forests has since been less one of reducing the forested areas than of degrading the remaining patches of forest. In order to examine the factors that have contributed to this forest degradation more closely, it is worth distinguishing between two altitudinal levels:

-- a thickly settled and agriculturally intensive region under 2,400 m, whose forested areas, made up of deciduous and evergreen broad-leaved growth as well as, in dry areas, of pine trees, remain only in residual stands;

-- a less thickly settled region over 2,400 m (i.e., in essence, above the

upper borderline of permanently cultivated fields), which still contains dense patches of forest. The so-called "high-altitude and mist forests," constantly enshrouded in clouds during the monsoon, and consisting below 2,800 m of evergreen oak forests and above 2,800 m of coniferous forests, extend up to approximately 3,600 m. They give way towards the upper forest boundary to subalpine growth (beech, juniper, rhododendron).

In order to be able to gauge the influence on forests below 2,400 m, one must know the significance of these forests for agriculture. The agriculture of most poor mountain farmers is based on a subsistence economy without any appreciable income.

Artificial fertilizers can not be used to replace such traditional methods of renewing soil fertility as fallowing, rotating crops and using natural fertilizers. Natural fertilizers thus are of utmost importance, and livestock, their producers, serve a key function within the whole context of subsistence farming. There is no systematic production of fodder, however, so that the care of the animals, in terms of the quantity and source of their fodder, is subject to marked fluctuations during the course of a year. The supply is plentiful during the rainy season; in the dry period, however, when the grass has withered in the pastures, and even the remains from the harvest have been consumed, the only things left are the leaves of evergreens. Foliage is obtained by lopping off the leaves and branches of forest trees, and also field trees, which are the private property of the farmers. Ratios vary. Generally it may be said that in the lower lying areas, where patches of forest are particularly sparse, trees located in fields are the major source, whereas in higher altitudes forest trees are. The foliage is either taken to the fields and there fed to the livestock, which proceeds to pass on the ingested nutrients to the fields in the form of dung; or is else used as litter in barns and then, composted with dung, put out on the fields in small piles before the monsoon. In this way there occurs a constant transfer of nutrients from the forest and isolated trees to the fields. An attempt has been made to determine the minimum area of a forest that is required to keep up the productivity on one hectare of field surface without the forest being impaired. Values between 1.3 and 2.8 ha have been calculated. Since in large parts of the Nepalese mountain region a ratio of 1 ha of farmland to 1.3 or 2.8 ha of forest no longer exists, the overexploitation and consequent degradation of forests is taking place.

The consumption of firewood is viewed as one of the most important causes of forest destruction, but is probably less significant in comparison to agriculturally motivated uses. There is a lack of consensus, however, as to the amount of fuel being consumed and the proportion of it represented by firewood, from which figure the pressure put on forests by this form of exploitation might be calculated; the reason for this is that previous attempts at quantification have diverged widely, both regarding procedure and results. It should be noted that firewood, like fodder, is obtained not only from forests but also, by lopping, from trees in fields. Concerning the exploitation of evergreen broad-leaved forests, it may be said in general that more lopping than felling takes place in them.

Trees are felled principally for construction timber. In the lower lying regions, the portion of timber in house construction is less than at higher elevations, those above 2,000 m with easy access to enclosed coniferous forests of the mist forest level. In these forests, therefore, the cutting of timber assumes greater importance. The wood of coniferous trees - for example, the Himalayan fir - is favoured for the wooden shingles of house roofs. For the production of such shingles, only large and straight trees are felled. The selective felling carried out in this manner causes a thinning of the stands of trees, a decrease in their height and an increase in the portion of stunted growth - in short, a degradation of the coniferous forests. It may occur, in the process that the coniferous trees of the main stands are replaced by plants from the undergrowth - e.g. by various types of rhododendron.

Forest pasturing also exercises a significant influence, particularly in areas of subalpine undergrowth and along forest rims. Oversettlement together with fires pushes back the rims, thus leading to deforestation. It can be assumed that the deforestation of the Nepal Himalaya, less in comparison to the Terai and the Siwalik border ranges, occurs primarily along the upper boundaries of forests.

From what has been said up to now, it is clear that in many respects the so-called deforestation problem in Nepal is nowadays viewed with a greater feeling for nuances than it was some 15 years ago. This applies to the historical dimension, and in particular to the history of the forests after the opening of the country around 1950 - a history that until recently had been almost completely ignored under the influence of an explanatory model that took into account only the effects of modernization. It applies to the related question of judging the causes for the loss of forest land. Above all, however, it applies to the spatial dimension, that is, to the distribution pattern of deforestation processes, within which the difference between the Himalaya and the Himalayan foreland is particularly striking.

The effects of deforestation and forest degradation on run-off and surface run-off, as well as the less immediate effects of these mountain processes, are appraised in a different manner today. In the scenario of the 1970s, floods in the Gangetic plain were represented as a direct consequence of the destruction of forests in the Nepal Himalaya. The problem even became a political issue, being seen as a possible cause of environmental conflict between Nepal and India. Today the data on dynamic processes in the Nepal Himalaya, though still very sparse, are assessed with greater caution. There is also a tendency not only to exercise restraint when it comes to asserting connections that are not supported by facts, but to emphasize - and perhaps overemphasize - that the very notion of quantitative information is inadequate. Opinions that have previously been treated as certainties are beginning to wobble, particularly with regard to the following three points:

--the influence of humans on surface run-off;

--the influence of vegetation cover on run-off;

--the effects of increased run-off and accelerated surface run-off in mountainous regions on the neighbouring lowlands.

Whereas previously the particularly dramatic soil erosion in the Himalaya and the resulting sweeping of loose debris into watercourses was ascribed to a large extent to human causes, now the part played by natural surface run-off through gravitational processes (e.g. landslides) in a young (i.e. steep and tectonically unstable) mountain range has been reevaluated upward.

Our knowledge of the regulative influence of forests on run-off and thus on soil erosion through flowing water is based on measurements that have been largely carried out in mountain ranges in the temperate latitudes. These latter results have often been applied carelessly to the Nepal Himalaya, a climatically very different region. Measurements in Nepal indicate that occurrences of intensive precipitation, in a situation of greater soil absorption capacity, lead to surface run-off and accelerated soil erosion - even under the crown cover of a forest. Many more studies will be required to assess properly the relationship between vegetation cover, run-off processes and the extent of erosion. It seems certain, however, that the influence of intensive precipitation on run-off in mountainous regions is local in scope, and that sediments that make their way into riverbeds in mountain regions reach the lowlands only after a long interim.

Whereas the effects of deforestation and forest degradation in the economy of the landscape are controversial and still largely unexplained, the direct economic consequences for the rural population are clear for all to see. Forests serve such a variety of functions for the existence of mountain farmers in the Himalaya that they were accurately described as "provider forests" by the German forester F. Heske, who was employed at the beginning of the century as an adviser to the Maharaja of Tehri Garhwal. In most cases, these forests are nowadays too small in area and too degraded to be able to fulfil this function any longer. The result is a phenomenon of dearth, particularly as regards fodder-producing foliage and firewood. The dearth has led in many places, on the other hand, to the rural population engaging in self-help initiatives. Within the past few years numerous examples of so-called "indigenous forest management systems" have become familiar in Nepal. Such schemes have been set up by village communities without outside support, and encompass everything from forest protection measures to ways to increase forest areas and the number of trees in the fields. The willingness to cooperate with forest development projects should also be mentioned in this connection, particularly when project goals are tailored to the needs of the farmers and pursued with their collaboration, as occurs, for example, in the "community forestry" approach.

The danger posed to forests in the Nepal Himalaya by the phenomena described here is a serious problem. It would appear to make little sense, however, to constantly conjure up the threat of complete deforestation in order to make the threat seem more real than it is. The fear thus aroused of a great ecological catastrophe blunts the perception of less spectacular but no less consequential degradational processes, and draws attention away from other problems. It has been seen how the focus of world attention on the Nepal Himalaya has let deforestation in the Terai go completely unnoticed.

If deforestation is declared to be the main problem, then reforestation appears to be the only sensible solution, and the increase of reforested tracts the standard of success, in the battle against it. Other measures, by contrast, such as the protection, care and gradual extension of still existing but degraded patches of forest, fall into the background. That the initiatives undertaken by farmers to protect forests and increase the number of trees was first "noticed" in the 1980s, when dire predictions concerning the immediate future of the Nepal Himalaya were first subjected to doubt, appears in this context to be quite telling.

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