Dr. Harka Gurung's Contribution in Physical Geography

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Contribution

Dr. Gurung had a large number of published and unpublished books, atlas, monographs, articles/papers and travelogues, paintings and drawings. A complete and systematic record of all his contributions has still to be developed. However, attempt has been made to prepare a list of his contributions so far reported in his books and articles. Based on the information so far available, Dr. Gurung had written more than 29 books including atlas, 16 monographs and 30 articles (Table 1). Some of the books and monographs are the compilation of many articles and travelogues. For example, there are 37 articles/papers compiled in one book – *Vishaya Vividh* published by Himal Book, Himal Association in 2006. Similarly, there are 9 articles/papers in one monograph – *Mountain Reflections: Pattern and Development* published by Mandala Publications in 2004. Those articles/papers published in books and monographs are not counted here in Table 1. If these articles/papers are also included, it shows that Dr. Gurung had written more than 80 articles/papers/books on different themes.

Table 1. Number of Contributions by Type of Documents

SN	Type	Total	Percentage
1	Post-Graduate Diploma Dissertation	1	1.2
2	Ph.D. Thesis	1	1.2
3	Book	29	34.9
4	Monograph	16	19.3
5	Article	30	36.1
6	Book Review	6	7.2
	Total	83	100.0

Dr. Gurung's contribution in different fields was driven by his job assignments in different fields. When he worked as Lecturer in the Tribhuvan University, his academic contribution was focused in physical geography. He had 12 contributions on physical geography especially on geomorphology before 1971 (Table 2). In between 1971 and 1980, he joined National Planning Commission, as Minister of Education and Tourism, and contributed more on social and tourism sectors. After he joined Population Institute, University of Hawaii as a Visiting Fellow and he focused his work on population, environment and development.

After the restoration of democracy in the country in 1990 and people's democratic movement, his focus was on social, political, economic and regional development and issues of inclusive development.

Table 2. Contributions of Dr. Harka Gurung by Themes in Different Periods

SN	Themes	Before 1971	1971-1980	1981-1990	1991-2000	2000 Onward	Total	Percent
1	Physical	12	1	1	1	2	17	20.5
2	Environment and							
	Development			5	3	2	10	12.0
3	Population		1	3	1	2	7	8.4
4	Social		2	1	3	11	17	20.5
5	Economic				1	2	3	3.6
6	Tourism	1	1	1	4	1	8	9.6
7	Regional	1			2	3	6	7.2
8	Political					2	2	2.4
9	Atlas			1	1	4	6	7.2
10	Others	1	2	1	1	2	7	8.4
	Total	15	7	13	17	31	83	100.0
	Percentage	18.1	8.4	15.7	20.5	37.3	100	

Contribution in Physical Geography

Geomorphology

The most important academic contribution of Dr. Gurung was on geomorphology. His doctoral work was on the geomorphology of Pokhara valley. By analyzing the morphology, sediment characterstics, river pattern, drainage density, discharge characteristics and longitudinal profile of river channel, he concluded that the deposition of Pokhara valley was under abnormal condition and challenged interpretations of the origin of Pokhara plain (Gurung, 1970). Hegen (1959 cited in Gurung, 1970) observed that the Pokhara plain was originated from the drying-up of a huge lake. According to Hagen, the last orogenetic movement caused the entire Pahar region between the High Himal and the Mahabharat Lekh to sink in opposition to the uplift of the Mahabharat Lekh. The subsidence resulted in the formation of large lakes in the Pahar region south of the High Himal. Hagen placed Pokhara Valley in the same category as the lacustrine valley of Kathmandu. Another interpretation on the origin of Pokhara plain was made by Glennie and Ziegler (1963 cited in Gurung, 1970). According to Dr. Gurung, the formation of the Pokhara plain was consequent upon the uplift of the southern hills. The rise of this southern barrier diverted the south-pluging Seti river laterally north-west to south-east retarding its excessive transporting

power. As a result, river transported materials from the high mountain were deposited into tectonic sedimentary trap around Pokhara behind the Barasami ridge. In contrary to the concept of the process of the formation of Pokhara valley due to alluvial process forwarded by Glennie and Ziegler, Dr Gurung considered that there has been a change in climate and suggested that the gravel deposits of Pokhara as a legacy of a perigalcial past. He viewed that avalanches on glacially over steepened hill-sides were active during the late stages of the final dissolution of the Ice Age. Numerous screes were built-up and their transportation was facilitated by gravity flow as well as vigorous pro-glacial streams. Although the present region may have never been glaciated, it is probable that the large boulders were carried by river-ice or drift-ice. The exceptional steepness could facilitate the overloaded proglacial streams to descend long distances and traverse valley of the Seti at Pokhara provided a receptacle to all these materials. He concluded that the plain of Pokara was built-up by a large valley train emanating at the head of the Seti valley and the outwash in-fillings are the remains of the abnormal phase.

In addition to the proposition on the origin of Pokhara plain, he had discussed different morphometric properties of the hills (Pahar) and mountains around Pokhara valley. His important observations were:

- The highlands in the north have the higher relief value than the southern hills
- The Yangdi-Madi anticlinal axis forms a morphological boundary between two types of hill topography. North of the axis lie the well-dissected highlands and southwards occur a series of strike-ridge in different directions
- The scarp-and-dip topography of this area is not due to monoclinal structure but rather due to thrust-fault
- The gravel mass filling the pre-glacial valley of Pokhara has been worked-up by the Seti into extensive terraces as well as steep gorges.
- The glacio-fluvial deposits along the main Seti valley acted as barriers to the tributary streams. As a result, many lakes were formed. However, the local slope, the amount of debris and the erosive power of the stream are the major factors responsible for the persistence and drain away of these lakes
- There has been shrinking of Begnas and Rupa lake with the hill-wash

Dr. Gurung was not only the first rated field geomorphologist but he also had a commanding theoretical knowledge on the process of landform evolution. He had published an article on Orogenesis of the Himalayas in which he discussed the theories of mountain building in relation to Himalaya orogenesis and the palaeogeography of the Himalayas (Gurung, 1967). He had reviewed different concepts, hypothesis and theories of mountain building. These included Continental Sliding Theory, Continental Drift Theory of Wegener, Intrusion Theory, Theory of Thermal Contraction, Holmes's Hypothesis, Undation Theory of Bemmellan, the Tectogene Concept of Hess and Plutonic Hypothesis of Billing. He pointed out

that these concepts explain partially not the whole and mountain building is neither a product of one type of diastrophism. Forces as complex as the structure they create have gone into the making of the most telling terrestrial landmark - the mountains. He concluded that the mountains may be likened to the facial expressions of what goes within the interior of the earth. He had also discussed the chronology of the formation of different mountains in the Himalayas. He pointed out that the first spasms of the birth of the Himalayas took place in the pre-tertiary upheavals, the second upheaval in the Upper Eocene (Kirthar bed) and the third towards the end of the Pliocene. The fourth Himalayan paroxysm ('Siwalik folding') took place towards the close of the Pliocene and the fifth and final upheaval during the Pleistocene period. He also concluded that the successive overloading of the Gangetic alluvial trough must have some counter-effect on the unloading of the Himalaya and thus the Himalayas are maintained by these two balancing factors.

Another important geomorphological study of Dr. Gurung was in the Chure range with this author (Gurung and Khanal, 1988). Attempts were made to identify various geomorphic processes, describe various landforms, assess change in land use, and prepare geomorphic maps of the sample locations. The main findings and conclusions of this study were:

- The Chure has three distinct lithological zones – the upper, the middle and the lower
- Many of the rivers fall in the fourth order and the geological structure and the basin shape seem major controlling factors in relief ruggedness
- Both the surface runoff and sediment discharge from the hillslopes are very high
- The elevation of the Chure range from the adjoining plain is higher in the west than in the east
- Southern slope is much more steep than the northern one
- Mass-wasting, hillslope slumping, surface erosion, and vertical as well lateral cutting of the rivers are the major geomorphic processes
- There is very high rate of surface erosion (2.11-4.23 cm per year)
- The processes of change in land use are not very old. Forest land has been converted into cultivated land. In a few cases, irrigated *khet* land has been converted into dry *pakho* land due to decreasing water table and increasing flood events
- Since the area is inhabited by the recently migrated people from the hills and mountains their experiences regarding geomorphic processes and damages is short. Most of the vocabularies relating to physical environment used in the hills are also used in this area which is geologically and morphologically very different from the hills. Thus their efforts to mitigate geomorphic hazards are not very effective.

Mountain Landscape

Dr. Gurung had also discussed physical pattern of Nepal and tried to divide it into different natural divisions (Gurung, 1968, 1971, 2004, 2005). He had divided Nepal into 8 natural divisions. From south to north, these divisions are the Terai, the Churia hills, the Dun or Bhitri Madhes (Inner Terai), the Mahabharat Lekh, the Pahar (Hills), the Main (high) Himalaya, the Bhot Valley, and the Tibetan Marginal Mountains. He pointed out that there are specific native terms for various elevation zones (*pahar* without snow, *lekh* with winter snow, and Himal with permanent snow) and landforms (*dun* in the west, *madhi* in the central, and *khonch* in the east for the Inner Terai) and recommended to use such terminology first based on elevation zone and second based on regional name in classifying Nepal into different landscape units. He emphasized that native appreciation of their landscape is more important than inventing new for the classification and naming landscape.

Dr. Gurung had also tried to clarify some of the concepts regarding mountain environment and development (Gurung, 2005). According to him, the degree of human intervention in natural ecosystem varies in rapacity both in time and space depending on whether it is for survival (poverty) or conspicuous consumption (affluence). He added that advances in science and technology have, however, obliterated the middle path between traditional immobility and materialistic heedlessness. With regard to the concept of mountain fragility, he proposed that mountains are not fragile; they are highly dynamic due to its high energy environment. Similarly, he opinioned that human activities do contribute to deforestation but extent of human impact on consequent land degradation remains in unknown quantity and mass wasting in the mountain area takes place independently of vegetation cover. He also pointed out that bad land use practices is not due to ignorance of environmental degradation among native people, but those are the adaptive mechanism for survival in the absence of alternative modes of livelihood. He added that poverty is the basic cause of poor land management and the risk can only be mitigated through economic development in the context of Nepal.

Another most important contribution of Dr. Gurung is the study of landscape change in Lamjung district (2004a). By analyzing data derived from interpretation of time series aerial and terrestrial photographs (1958-2002), field observation (1946-2002), and interview with local people, he had made the following conclusions on landscape change.

- Natural processes that shape landforms have a cyclical nature while cultural forms exhibit linear and progressive development
- Geomorphic processes are very forceful in high relief area and they become evident from periodic trigger events rather than normal events
- The chronology of natural events stamped in local memory were of three types – landslide, bridge collapse and flood damage

- A significant cultural process that impacted the landscape was upgrading of transport infrastructure and improvement in environment with the control of pest and diseases (malaria eradication)
- Mountain landscape is highly dynamic but with system recovery and self regulation. For example, most landslides were stabilized with vegetation and some new ones were observed. This finding challenges the concept of fragility of mountain environment.
- There has been a significant increase in abandoned land with vegetative cover in areas away from settlement. It should be noted that this finding contradicts with the concept of Himalayan environmental degradation proposed by Ekholm (1976).

Biogeography and Climatology

Dr. Gurung had also contributed in the fields of biogeography and climate. Dr. Gurung had divided Nepal into four phyto-geographical areas (Gurung, 2004). These included i) eastern Nepal or Kosi watershed without xerophylic plants, ii) central Nepal or Gandaki watershed with co-existence of hydrophilic and mesophilic plants, iii) western Nepal or Karnali watershed with co-existence of mesophylic and xerophilic plants and iv) north-west Nepal or trans-Himalaya with steppe vegetation of Central Asia. He had discussed the climate of Pokhara valley and pointed out that Pokhara is exposed both to the summer monsoon and winterly jet-streams and these two air masses give a distinct seasonal character to which the rhythm of life is closely attuned (Gurung, 1965). He also added that nocturnal inversion of temperature occurs when down-valley winds reduce the temperature after sunset at lower levels. The katabatic winds funneling down the higher mountain slopes are most pronounced in the evening, and during March-April these acquire gale force, causing much damage to the buildings.

At the End

It is evident from the above discussion that Dr. Gurung had contributed a lot in physical geography by proposing several new concepts and pointing out misconceptions which were generally held. He used to encourage Nepali geographers to contribute more in physical geography. By reviewing the articles published in the Himalayan Review, a journal of Nepal Geographical Society, Gurung, (1980) had observed that the various aspects of physical geography are not only poorly represented but many are entirely lacking (1980). He had added that there are no articles on geology, glaciology, pedology and plant geography in which field foreign researchers have done much work in Nepal. He was surprised that in a country imbued with some of the largest Himalayan rivers with tremendous hydropower and irrigation potential, geographers have yet to turn to hydrography or water resources. He had recommended that there should be more avenues for research and publication on current issues such as water resources, environmental stress, land use change, population dynamics and air transportation.

Dr. Gurung was the source of scholarship and his patronage in the development of physical geography particularly mountain geography in Nepal remained highly commendable. He will be remembered as a Himalayan scholar. He will be missed by all those who are interested in the study of Himalayas. I will greatly miss him for ever as an inspirer.

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